

SELECTED
 **WATER
RESOURCES
ABSTRACTS**

VOLUME 4, NUMBER 18
SEPTEMBER 15, 1971

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A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior



VOLUME 4, NUMBER 18
SEPTEMBER 15, 1971

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SELECTED WATER RESOURCES ABSTRACTS

A Quarterly Publication of the Water Resources Research Institute
Office of Water Resources Research, U.S. Department of the Interior

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.



VOLUME 4 NUMBER 12
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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus** (November 1966 edition). Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency, Water Quality Office. A directory of the Centers appears on inside back cover.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE

Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION

Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL

Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION

Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING

Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA

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Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES

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10 SCIENTIFIC AND TECHNICAL INFORMATION

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

A LABORATORY STUDY OF THE SOLUBLE METALS IN ROCK FROM THE BROAD QUADRANGLE, GEORGIA,
Georgia Inst. of Tech., Atlanta. Water Resources Center.

For primary bibliographic entry see Field 02K.
W71-09466

CARBONATE SPECIES AND NOT POLY-WATER FORMED ON MAGNESIUM OXIDE,
Cambridge Univ. (England). Colloid Science Labs.; and Cambridge Univ. (England). Dept. of Biochemistry.

T. L. Whately.
Nature, Physical Science, Vol 231, No 25, p 178-179, June 21, 1971. 2 p, 2 ref.

Descriptors: *Water properties, *Aqueous solutions, *Carbonates, Magnesium, Spectroscopy, Water analysis, Water chemistry.
Identifiers: *Polywater.

The infrared spectrum of polywater formed on magnesium oxide can more readily be interpreted in terms of the presence of carbonate species. Magnesium oxide readily adsorbs carbon dioxide, and the infrared spectra of carbon dioxide and water adsorbed separately and together on MgO powder show a number of adsorption bands in the region 1,300-1,665/cm. The observation that magnesium hydroxide or MgO after soaking in liquid H₂O gives no such spectrum supports the interpretation of the observed spectrum in terms of carbonate species. (Knapp-USGS)
W71-09625

02. WATER CYCLE

2A. General

HYDROLOGIC RECONNAISSANCE OF THE DELTA RIVER AND ITS DRAINAGE BASIN, ALASKA.

Cold Regions Research and Engineering Lab., Hanover, N.H.

S. L. Dingman, H. R. Samide, D. L. Saboe, M. J. Lynch, and C. W. Slaughter.

Available from the National Technical Information Service as AD-722 217, \$3.00 in paper copy, \$0.95 in microfilm. CRREL Research report 262, Feb 1971. 83 p.

Descriptors: *Rivers, *Flow, *Drainage, *Hydrologic data, *Glaciers, Melting, Sedimentation, Rainfall, Inland waterways, Remote sensing, Serial photography.
Identifiers: Aerial reconnaissance, *Alaska, Hydraulic models, Delta River, Stream flow.

A one-year reconnaissance study was made of a large braided glacial river and its drainage basin (drainage area 1665 m²; elevation range 1000 - 10,000 ft) for which a minimum of hydrometric and meteorologic data existed. The report includes estimates of the water balance, flow-duration curves, and sediment characteristics, and descriptions of stream response to glacial melt and rain, channel geometry and channel processes. Mean annual basin precipitation is estimated at 40.4 in. and mean annual loss of permanent glacial storage is about 1 in. About 30% of this leaves the basin as evapo-transpiration, 50% as stream flow, and 20% as groundwater flow. Characteristics of response to glacial melt are outlined. Flow peaks near the mouth occur with 24 hours of rainfall greater than 0.5 in./day at foothills meteorological stations; rains of less than that amount do not generally produce discernible stream response. Stream channel geometry is described in detail. Most channels on

the lower floodplain are asymmetrical and are roughly triangular or parabolic, and have high width/depth ratios. At-a-station hydraulic geometry is described. Surveys and ground and aerial photography are used to describe channel changes.
W71-09566

FORECASTING THE SPRING 1969 MIDWEST SNOWMELT FLOODS,

National Weather Service, Kansas City, Mo, Central Region.

Herman F. Mondschein.

Available from the National Technical Information Service as COM71-00489, \$3.00 in paper copy, \$0.95 in microfiche. NOAA Technical memorandum NWS-CR-40, Feb 1971. 5 p.

Descriptors: *Flood forecasting, *Snow melt, *Flood Control, *Mathematical models, Missouri, Sequential generation, Surface runoff, Snowfall.
Identifiers: Spring season, Sequential analysis.

The winter of 1968-69 in the upper midwest was one of the worst on record, resulting in a long period of very heavy snow of high water content over a very large area, with widespread, disastrous spring floods in its wake. The use of hydrologic data by the National Weather Service's River Forecast Center in Kansas City, Missouri, to estimate flood potential up to 2 1/2 months prior to the onset of flooding, and for day-by-day short-term flood forecasting is described. The principle ingredients involved in determining the magnitude and extent of snowmelt flooding are shown to be: (1) the depth of runoff which is a function of water equivalent of the snowpack at the onset of melt, precipitation during the melting period, and antecedent soil moisture. (2) the rate of melt which is shown to be related to daily air temperature and snowpack water content. The application of digital computer technology to hydrologic models has been of inestimable value in the processing of hydrologic data for the specific purpose of river stage and flood forecasting. Examples of these computer applications to flood prediction in the 1969 upper midwest spring snowmelt floods are shown.
W71-09571

CONVERGENCE CRITERIA FOR ITERATIVE HYDROLOGIC ROUTING MODELS,

Water Resources Engineers, Inc., Springfield, Va.

G. K. Young.

Water Resources Research, Vol 7, No 3, p 536-542, Jun 1971. 7 p, 1 fig, 5 tab, 4 ref. Bur Public Roads Contract FH-11-7324.

Descriptors: *Routing, Numerical analysis, *Rain-fall-runoff relationships, Open channel flow, Dynamic programming, Mathematical studies, Mathematical models, Water storage, Stage-discharge relations, Model studies.
Identifiers: *Routing models.

An iterative process used to solve flow dynamics is discussed using a highway culvert and embankment system as an example. Time step criteria govern convergence of the iterative process. The Lipschitz ratio is applied to calculate the controlling algebraic time step relationship. The time step for convergence varies with current inflow and antecedent storage. Parameters of the iterative process are calculated for the example by assuming nonlinear functional forms for stage storage and discharge storage relationships by inferring the appropriate coefficients. Numerical results are presented for several extreme cases that bracket orifice and weir flow conditions. The approach should be applicable to other hydrologic systems such as small dams, catch basin flow, and retarding basins. This analysis aids in a selection of a time increment for direct routing for the direct conversion of rainfall excess to watershed outflow. (Knapp-USGS)
W71-09610

AN OUTLINE OF THE DEVELOPMENT OF HYDROLOGY IN THE USSR (Russian: Ocherki razvitiya gidrologii v SSSR),

A. A. Sokolov, and A. I. Chebotarev.

Leningrad, Gidrometeoizdat, 1970. 310 p.

Descriptors: *Water resources, *Water resources development, *Water balance, *Hydrologic data, *Hydrologic aspects, Forecasting, Flow, Hydrographs, Runoff, Soils, Rivers, Hydrometry, Lakes, Reservoirs, Floods, Evaporation, Ice, Snow, Instrumentation, Heat balance.
Identifiers: *USSR, State Hydrological Institute, Hydrophysical studies, Hydrochemical studies, Hydrological stations.

A history of the study of water resources of the USSR is examined with particular reference to investigations conducted by a leading institute in Soviet hydrological research, the State Hydrological Institute. The role of the Institute in establishing a basic network of hydrological stations and in developing theoretical, experimental and field studies is discussed in the light of concrete achievements and trends observed in the utilization of water. Plans for the maximum development of USSR water resources involve water balance estimates to 1980, 2000, and even beyond, taking into account the rapidly growing exploitation of water resources and the influence of human activity on the transformation of river regimes. A bibliography of the more important Soviet publications on hydrology is appended to each of the 11 chapters. (Josefson-USGS)
W71-09646

A GENERALIZED PROBABILISTIC APPROACH TO REGIONAL WATER SUPPLY ASSESSMENT,

Environmental Dynamics, Inc., Los Angeles, Calif.

For primary bibliographic entry see Field 06A.

W71-09735

USE OF HARMONIC ANALYSIS TO STUDY TIDAL FLUCTUATIONS IN AQUIFERS NEAR THE SEA,

Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.

For primary bibliographic entry see Field 02F.

W71-09824

VARIABILITY OF ANNUAL RUNOFF IN THE LAKE ONTARIO BASIN,

Windsor Univ. (Ontario). Dept. of Geography.

For primary bibliographic entry see Field 02E.

W71-09825

2B. Precipitation

AIRBORNE MEASUREMENTS OF THE TOTAL HEAT FLUX FROM THE SEA DURING BOMEX,

California Univ., San Diego, La Jolla; Scripps Institution of Oceanography, La Jolla, Calif.; and Atlantic Oceanographic and Meteorologic Labs., Miami, Fla.

For primary bibliographic entry see Field 07B.

W71-09602

MONSOONAL RESPONSE IN THE WESTERN INDIAN OCEAN,

Rosentiel School of Marine and Atmospheric Science, Miami, Fla.; and National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.

Walter Duing, and Karl-Heinz Szekielda.

Journal of Geophysical Research, Vol 76, No 18, p 4181-4187, June 20, 1971. 7 p, 4 fig, 1 tab, 15 ref. ONR Contract N0014-67-A-0201-0013, Project NR 083-06017-16-70 (481).

Descriptors: *Ocean currents, *Indian Ocean, *Monsoons, *Synoptic analysis, Winds, Advection,

Field 02—WATER CYCLE

Group 2B—Precipitation

Currents (Water), Convection, Temperature, Heat balance, Seasonal, Climatology.
Identifiers: *Somali current.

Infrared observations from spacecraft were used to investigate the response of the Somali Current to the onset of the southwest monsoon. Selected satellite observations from three years were available for this study. The time-dependent development of horizontal temperature gradients at the sea surface serves as an indicator for the formation of the baroclinic structure of the Somali Current. A comparison is made with the simultaneous development of the southwest component of the monsoon wind. The investigation reveals that the temperature gradient during the early formation stage in all years are directly proportional to the wind speed. The phase lag between the development of wind and temperature gradient during the buildup of the boundary current has a mean value of twelve days. During the decay period in late summer and fall, the lag increases continuously up to forty days. The observations suggest that two phenomena of different spatial scales play an important role during the formation of the Somali Current; in the early stage (May, June), local wind-induced upwelling seems to be the more important source of baroclinicity; in the latter stage of the buildup (July), large-scale geostrophic effects seem to be dominating. (Knapp-USGS)
W71-09603

THE METEOROLOGY OF KANSAS DROUGHTS,

Kansas Water Resources Board, Topeka.
Donald Kostecki.
Kansas Water News, Vol 13, Nos 4, 5, and 6, p 17-21, 1970. 5 p, 2 fig, 2 tab, 5 ref.

Descriptors: *Droughts, *Kansas, *Meteorology, *Synoptic analysis, Reviews, Climatology, Dust storms, Moisture deficit, Precipitation (Atmospheric), Water storage.

A brief review is presented of the causes and effects of droughts in Kansas. In Kansas, except for the dry-weather flow of some streams and the water pumped from confined aquifers, precipitation is the only source of water supply. Consequently, and particularly when concerned with an extended dry period, the amount of precipitation received compared to the normally expected amount during the period is a reasonable measure of the magnitude of moisture deficiency. Drought is caused by the persistence of a given pattern of large high and low pressure cells in the global circulation pattern of the atmosphere. Normally, a dynamic high pressure cell, called the Azores High, expands during the warm months of the year and contracts during the colder months. As it expands, it pumps moist air from the Gulf of Mexico into the Great Plains in the spring and the contact of the warmer moist air with colder continental air creates the spring and early summer rains common to Kansas. As it contracts in the fall, another increase in rainfall occurrences often takes place. However, if this high pressure cell expands earlier and remains longer, the effect is a lack of precipitation and drought conditions. Droughts of the 1930's and 1950's were not equally severe for all parts of Kansas. The 1950's drought was the worst of record for much of eastern Kansas, and the peak of the drought of 1956 was more severe than any peak period during the 1930's for most areas of the state. In contrast, the drought of the 1930's was by far the longest of record with more disastrous consequences state-wide. (Knapp-USGS)
W71-09656

A THREE-DIMENSIONAL APPROACH TO THE EXCHANGE OF HEAT AND WATER VAPOR BETWEEN A LARGE WATER BODY AND THE ATMOSPHERE,

Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 02D.
W71-09739

WATER RESOURCE OBSERVATORY WIND DATA - WATER YEAR 1969 AND PRIOR,
Wyoming Univ., Laramie.
For primary bibliographic entry see Field 07C.
W71-09745

2C. Snow, Ice, and Frost

WATER CONDITIONS IN CALIFORNIA.
California State Dept. of Water Resources, Sacramento.

Report No 1, February 1, 1971, 15 p, 24 fig, 3 tab.
Bulletin No 120-71.

Descriptors: *Snow surveys, *California, *Snowpacks, *Water supply, *Runoff, Reservoir storage, Water resources, Precipitation (Atmospheric), Snow.

Identifiers: *Water conditions.

The first monthly comprehensive statewide snow surveys of the 1971 season revealed that California's snow zone is storing up to one and one-half times the normal amount of water. A nine day storm in November, followed by a second intense cold storm that continued into December, produced a near record early season snowpack. This heavy snow cover was somewhat diminished during mid-January when moderate but warm rain swept over the mountain crests in Central and Northern California. In addition to causing a short period of premature runoff from the snowpack, the rains brought higher elevation snow densities up to about 40%, which is higher than usual for the time of year. This may accelerate early ripening of the snowpack this year. Runoff quantities during January reflected the storm pattern, producing up to 200 percent of normal flows in the northern part of the state, about 130 percent of normal in the central portion, and diminishing to near average in the San Joaquin Valley tributaries. Reservoir storage is excellent throughout the state, benefiting from January's warm rainstorms that produced extensive low elevation snowmelt inflows, especially in central and northern California streams. (Poertner)
W71-09586

PHYSICAL PROPERTIES OF ALPINE SNOW AS RELATED TO WEATHER AND AVALANCHE CONDITIONS,

Forest Service (USDA) Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
M. Martinelli, Jr.
Forest Service Research Paper RM-64, January 1971. 35 p, 18 fig, 6 tab, 34 ref, append.

Descriptors: *Avalanches, *Snowpacks, *On-site tests, *On-site data collections, Sampling, Colorado, Snow management, Safety, Shear strength, Tensile strength, Compressive strength, Stress, Strength of materials, Yield strength, Forecasting, Surveys, Density, Permeability, Weather, Snow.

Identifiers: *Snow physical properties, *Avalanche forecasting.

Data were taken in avalanche starting zones at an elevation of 11,700 feet in Front Range of Colorado within 14 days of deposition. Densities varied from 40 to 450 kg per cu m. A statistical criterion was used to identify snow with unusually high density for its age (initial hard slab) and unusually low (persistent soft snow). Initial hard slab, found in 15 percent of the samples, correlated with moderate to high windspeeds, low temperatures, and presence of wind-transported snow. No good way was found to distinguish initial hard slab from dense older snow. Tensile strength from a spin test varied from 1.0 to 1,712 grams force per sq cm. Strength increased with density but varied greatly for given density. Younger snows tended to be weaker than older snows of the same density. Strength was also measured with shear box and shear vane. Ram resistance was higher for alpine snow than for snow of the same density in trees. Air

permeability varied with the low flow rate used. The ratio of virtual porosity/porosity, which averaged 1.062, was of little value for identifying wind slab. (Knapp-USGS)
W71-09596

A STUDY OF WINTERTIME HEAT LOSSES FROM A WATER SURFACE AND OF HEAT CONSERVATION AND HEAT ADDITION TO COMBAT ICE FORMATION IN THE ST. LAWRENCE RIVER,
National Research Labs., Ottawa (Ontario).
For primary bibliographic entry see Field 02D.
W71-09773

2D. Evaporation and Transpiration

EVAPOTRANSPIRATION AND ITS CHEMICAL REDUCTION,
Kansas State Univ., Manhattan. Water Resources Research Inst.

William L. Powers, Gary M. Paulsen, Rosendo K. Palis, Lynn J. Brun, and Edward T. Kanemasu.
Available from the National Technical Information Service as PB-200 823, \$3.00 in paper copy, \$0.95 in microfiche. KWRR Contribution No 64, (June 1971), 58 p, 13 fig, 1 tab, 21 ref. OWRR Project B-010-KAN (1).

Descriptors: *Evapotranspiration, *Transpiration, Kansas, *Lysimeters, Microclimate, Photosynthesis.

Identifiers: *Antitranspirants.

This project consisted of a laboratory phase and a field phase. For the laboratory phase several chemicals were screened for their potential in decreasing transpiration. Because transpiration is water evaporation from the stomata of plant leaves, chemicals which partially close the stomata will reduce transpiration. The closure of the stomata may also reduce CO₂ diffusion into the plant and thus may reduce photosynthesis and crop yield. Measurements of both photosynthesis and transpiration were made on plants treated with selected chemicals. Several chemicals appeared promising. For the field phase, two sensitive weighing lysimeters were constructed and various atmospheric sensors assembled on a 5-acre site about 2 miles southwest of Manhattan, Kansas. During the summer of 1970 sorghum and soybeans were planted on this site and the evapotranspiration from these crops characterized. A model for evapotranspiration based on the resistance to vapor diffusion of a single leaf was tested on an hourly basis. (Powers-KWRR1)
W71-09556

EVAPOTRANSPIRATION AND ENERGY BALANCES OF FOREST AND FIELD,

Aberdeen Univ. (Scotland). Dept. of Botany.
S. J. Tajchman.
Water Resources Research, Vol 7, No 3, p 511-523, Jun 1971. 13 p, 2 fig, 7 tab, 48 ref.

Descriptors: *Evapotranspiration, *Crops, *Forests, *Energy budget, *Heat balance, Convection, Heat transfer, Potatoes, Solar radiation, Microclimatology, Micrometeorology, Advection, Heat flow, Vegetation effects.

The energy and water balance components of a 70-year-old Norway spruce forest, a 2-year-old alfalfa field, and a potato field near Munich Germany, were computed for the period May-October 1965 by using hourly averages of meteorologic parameters. Turbulent diffusion and energy budget methods were used to determine evapotranspiration and convective exchange. The two methods yielded satisfactory agreement for the low crops but not for the forest. The mean seasonal albedo values for the potatoes and crops but not for the forest. The mean seasonal albedo values for the potatoes and the alfalfa were 0.18 and 0.22, respectively. The albedo of the forest was obtained for 1

day and averaged 0.05. The shortwave incoming radiation over the forest was 12% less than that over the fields. The net shortwave radiation over the forest was 2 and 7% greater than that over the potatoes and the alfalfa, respectively, whereas the long wave emission from the forest was 22 and 15% less than that from the potatoes and the alfalfa, respectively. The total net radiation over the forest was 20% greater than that over the alfalfa and 16% greater than that over the potatoes. Sensible heat flux from the forest was 2.6 and 1.6 times greater than that from the alfalfa and the potatoes, respectively. Evapotranspiration from the forest was 4% less than that from the alfalfa but 14% greater than that from the potatoes. The exchange coefficient at the top of the trees was about 100 times as large as that at the top of the crops. (Knapp-USGS)
W71-09608

A THREE-DIMENSIONAL APPROACH TO THE EXCHANGE OF HEAT AND WATER VAPOR BETWEEN A LARGE WATER BODY AND THE ATMOSPHERE,

Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
Gour-Tsyh Yeh, and Wilfried Brutsaert.
Available from the National Technical Information Service as PB-201 003, \$3.00 in paper copy, \$0.95 in microfiche. Technical Report No 30, April 1971, 23 p, 7 fig, 6 tab, 9 ref. OWRR Project A-021-NY (1).

Descriptors: *Turbulence, Diffusion, *Evaporation, Atmosphere, Heat, Water vapor, Heat balance, Heat budget, Turbulent flow.

In the finite difference formulation of the two-dimensional steady state turbulent diffusion equation for solving evaporation problems, two difficulties arise caused by the automatic satisfaction of one of the boundary conditions at the surface and by the infinite size of the solution domain. A general numerical scheme is developed to overcome these difficulties by the use of appropriate transformations. The results of some numerical experiments show that the longitudinal diffusion term is usually negligible and that with suitable parameters for roughness and stability power laws can be as useful for practical solutions as the more complicated logarithmic law.
W71-09739

A STUDY OF WINTERTIME HEAT LOSSES FROM A WATER SURFACE AND OF HEAT CONSERVATION AND HEAT ADDITION TO COMBAT ICE FORMATION IN THE ST. LAWRENCE RIVER,

National Research Labs., Ottawa (Ontario).
F. W. Pruden, R. L. Wardlaw, D. C. Baxter, and J. L. Orr.
Division of Mechanical Engineering, Report No. MD-42, p. 189, June 30, 1954. 34 fig., 13 tab., 112 ref.

Descriptors: *Heat transfer, *Water temperature, *Evaporation, *Solar radiation, *Navigable rivers, Meteorology, Heat flow.
Identifiers: *Ice formation, *Heat addition, *St. Lawrence River, Ice control, Heat loss, Heat conservation.

Re-examination of the technical problems of providing year-round navigation in the St. Lawrence River seaway, ship canal, the gulf and various lake parts are discussed in the present work. A major part of the problem is considered to be the maintenance of navigation in the St. Lawrence River from Lake Ontario to Three Rivers, Quebec, where tidal effects began to be felt. The description of the heat loss process in the river is taken in two parts: (1) formulation of the heat loss rate in a sufficiently simple coefficient form that can be integrated along the length of the river and throughout the season, and (2) the expression of the meteorological statistics as the probability of occurrence of a particular condition at a particular locality. Calculated total heat loss rates were found

to be in reasonable agreement with observations under normal conditions. Difficulties of predicting extreme values of heat loss in the design of protection systems are discussed. The design of several systems to extend the navigation season has been examined to determine the parameters to which the design is most sensitive and hence to indicate the most profitable lines of investigation. A rational design procedure for a heater system has been formulated and the order of magnitude of component costs estimated. (Herrera-Vanderbilt)
W71-09773

THE SINUSODIAL FUNCTION OF REGIONAL MONTHLY AVERAGE RELATIVE PAN EVAPORATION,

Tecnion - Israel Inst. of Tech., Haifa. Dept of Civil Engineering; and Water Planning for Israel Ltd., Tel Aviv.
Joseph S. Dalinsky.
Water Resources Research, Vol 7, No 3, p 677-687, June 1971. 11 p, 5 fig, 4 tab, 6 ref.

Descriptors: *Evaporation, *Fourier analysis, Regional analysis, Climatology, Arid lands, Statistical methods, Statistics, Evaporation pans, Seasonal. Identifiers: *Israel.

An analysis was made of data from 47 stations in Israel at which evaporation had been measured by means of U.S. Weather Bureau class A pans protected by wire mesh. The stations represent different climatic conditions ranging from subhumid to arid. The stations are situated on the Mediterranean coast, in the desert (the Arava Valley), in valleys, in plains, and in mountains. The average relative evaporation in each month was found to be equal at all the stations and could be expressed as a sinusoidal functions. The small deviation from the sinusoidal function make computation of correlations superfluous. As a result of this finding, it is possible to estimate the average evaporation rates for every month and for every location in the country by using one parameter (the amplitude of the sine function) and a map of average annual evaporation depths. (Knapp-USGS)
W71-09814

EVAPORATIVE CAPACITY OF UNSATURATED AIR,

National Weather Service, Rockville, Md. Office of Hydrology.
A. K. Showalter.
Water Resources Research, Vol 7, No 3, p 688-691, June 1971. 4 p, 2 fig, 1 tab, 2 ref.

Descriptors: *Evaporation, *Microenvironment, *Temperature, Vapor pressure, Raindrops, Drops (Fluids), Humidity.
Identifiers: *Evaporative capacity (Air).

Falling water droplets quickly assume surface temperatures equal to the wet-bulb temperature of the air. Formulas for absolute humidity and Ferrel's psychrometric formula are used to develop a simple relationship for calculating the capacity of air to absorb water droplets evaporated into it. Such data may be used for determining water losses during sprinkler irrigation, the discrepancy between radar observed liquid water contents and ground observed rainfall, and other factors important in the hydrologic balance of the atmosphere. The evaporative capacity of the air is determined to be explicitly defined by an equation involving wet-bulb temperature, wet-bulb depression, and atmospheric pressure. (Knapp-USGS)
W71-09818

2E. Streamflow and Runoff

PRELIMINARY REPORT ON THE WATER RESOURCES OF SOUTHEAST MAUI, HAWAII, Geological Survey, Honolulu, Hawaii.
K. J. Takasaki.

Hawaii Division of Water and Land Development Circular C58, March 1971. 37 p, 10 fig, 3 tab, 13 ref.

Descriptors: *Water resources development, *Groundwater, *Surface waters, *Hydrologic data, *Hawaii, Rainfall-runoff relationships, Springs, Aquifer characteristics, Hydrogeology, Geology, Permeability, Streamflow, Water yield, Water quality, Chemical analysis, Water utilization, Grazing, Livestock, Flow measurement, Perched water, Water storage, Hydrographs.
Identifiers: Maui (Hawaii), Basal water.

Southeast Maui, Hawaii, is about 135 square miles in area and comprises the southern part of Haleakala National Park and the southern slope of Haleakala. The principal land use is low-intensity grazing. Population in 1970 was less than 100. Mean annual rainfall ranges from about 25 inches throughout the central part to about 100 inches near the eastern boundary and to about 50 inches near the western boundary. In about half of the study area, the surface rocks are lava flows of the Kula Volcanic Series. In the other half, the Kula Series is overlain by highly permeable rocks of the Hana Volcanic Series. In most areas where the Hana Series crops out, rainfall absorption is so high and overland runoff so low that stream patterns have not been developed. Where the surface rocks are the less permeable Kula Series, runoff is higher and shallow stream channels have developed. Groundwater occurs as perched water and as basal water and likely as dike-impounded water in rift zones. The principal need for water is for livestock supply. (Woodard-USGS)
W71-09598

FLOOD PLAIN INFORMATION, TINKERS CREEK, TWINSBURG, SUMMIT COUNTY, OHIO.

Corps of Engineers, Buffalo, N.Y.
For primary bibliographic entry see Field 04A.
W71-09601

AN INVESTIGATION OF FLOODS IN HAWAII THROUGH SEPTEMBER 30, 1970,

Geological Survey, Honolulu, Hawaii.
C. J. Ewart.
Geological Survey Hawaii Basic Data Progress Report 13, March 1971. 166 p, 5 fig, 1 tab.

Descriptors: *Hydrologic data, *Peak discharge, *Hawaii, *Floods, Frequency analysis, Gaging stations, Stream gages, Data collections, Stage-discharge relations, Water levels.
Identifiers: Flood frequency.

Floods—mainly because of the high frequency of intense rainfall—are common in Hawaii. Knowledge of the magnitude and probable frequency of floods is necessary for design of control and conveyance structures, pollution abatement facilities, and planning for use of flood plains. Flood data are obtained through a network of stream-gaging and peak-discharge stations. The crest-stage gage data-collection network, begun on Oahu in 1957, was extended to Hawaii and Kauai in 1962 and Maui and Molokai in 1963. Records of floods from the regular long-term gaging station network augment those from the crest-stage gage network. Records of annual peak stage and discharge at gaging stations through September 30, 1970, and peak discharges at miscellaneous sites, are compiled. At the close of the water year, flood data from 72 regular gaging stations were being supplemented by data from 90 crest-stage gaging stations on Kauai, Oahu, Molokai, Maui, and Hawaii. (Knapp-USGS)
W71-09627

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR PIN OAK CREEK, TRINITY RIVER BASIN, TEXAS, 1969,

Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07C.
W71-09653

Field 02—WATER CYCLE

Group 2E—Streamflow and Runoff

GROUND OBSERVATIONS AND UTILITY EVALUATIONS OF SPACE AND HIGH-ALTITUDE PHOTOGRAPHY, EASTERN ARIZONA,
Raytheon Co., Alexandria, Va. Autometric Operation.
For primary bibliographic entry see Field 07B.
W71-09654

FLOOD WAVE MODIFICATION ALONG A PRISMATIC RIVER,
Indian Inst. of Tech., Kharagpur. Dept. of Civil Engineering.
Somenath Ghosh.
Water Resources Research, Vol 7, No 3, p 697-703, June 1971. 7 p, 8 fig, 8 ref, append.

Descriptors: *Floods, *Flood routing, *Flood forecasting, *Hydrograph analysis, Waves (Water), Stage-discharge relations, Hydrographs, Unsteady flow, Discharge (Water).
Identifiers: Flood wave modification.

The modification of a flood hydrograph in a uniformly wide river reach with no downstream control, taking into account the effect of pseudoviscosity terms, was studied graphically by using the method of characteristics. The routed profiles indicate the usual reduction in peak height and velocity with distance, and the stage discharge curve shows the familiar loop pattern. (Knapp-USGS)
W71-09819

VARIABILITY OF ANNUAL RUNOFF IN THE LAKE ONTARIO BASIN,
Windsor Univ. (Ontario). Dept. of Geography.
Marie Sanderson.
Water Resources Research, Vol 7, No 3, p 554-565, June 1971. 12 p, 5 fig, 4 tab, 13 ref.

Descriptors: *Rainfall-runoff relationships, *Lake Ontario, *Variability, *Water balance, *Statistics, Data collections, Stream gages, Runoff, Streamflow, Hydrologic budget, Great Lakes Region, Climatic data, Meteorological data, Hydrologic data.
Identifiers: *Runoff variability.

A study of variability of runoff in the Lake Ontario basin was undertaken to provide background information for the International Field Year on the Great Lakes to be held in 1972 on Lake Ontario, because a period of 1 year is a small sample in the life history of a lake basin, and there are large annual fluctuations in the variables in the water balance. Because of a lack of long-term records of measured runoff, the Thornthwaite-Mather water balance model for estimating point runoff from climatic data was used for the 81 stations in and near the basin with records of 15-136 years. Statistical tests show that annual station runoff has a normal distribution. Standard deviations were computed to express variability. Maps of average runoff, as well as plus and minus two standard deviations of runoff, were drawn and permit the estimation of the volumes of annual runoff that can be expected in the Lake Ontario basin. A coefficient of variability of runoff map indicates that the southwestern areas of the basin have the most variable runoff. (Knapp-USGS)
W71-09825

2F. Groundwater

HYDRAULIC TESTING AND SAMPLING OF WATER WELL NUMBER 1, PROJECT WAGON WHEEL, SUBLETTE COUNTY, WYOMING,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 04B.
W71-09593

HYDROGEOLOGY OF THE CARBONATE ROCKS OF THE LANCASTER 15-MINUTE QUADRANGLE, SOUTHEASTERN PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.

Harold Meisler, and Alvert E. Becher.
Pennsylvania Geological Survey Fourth Series Bulletin W-26, 1971. 149 p, 25 fig, 2 plate, 11 tab, 29 ref.

Descriptors: *Hydrogeology, *Carbonate rocks, *Pennsylvania, *Groundwater, *Aquifer characteristics, Geology, Aquifers, Water wells, Water yield, Specific capacity, Withdrawal, Drawdown, Water quality, Chemical analysis, Hydrologic data, Springs, Streamflow, Groundwater recharge.
Identifiers: *Groundwater resources, Conestoga Valley (Penn), Southeastern Pennsylvania.

Limestone and dolomite strata of Cambrian and Ordovician age underlie the lowlands of the Conestoga Valley in southeastern Pennsylvania. In the Lancaster quadrangle, where the Conestoga Valley attains its maximum width, the carbonate strata are divided into 14 units defined primarily by their relative proportions of limestone and dolomite. Of the 247 wells test pumped for 1-hour, 25% have specific capacities greater than 5.0 gpm per ft—the minimum considered to be adequate for public supply and industrial use; 58% have specific capacities greater than 0.5 gpm per ft—the minimum considered to be adequate for small public supply use, and 83% have specific capacities greater than 0.08 gpm per ft—the minimum considered to be adequate for domestic use. The average discharge of the Little Conestoga Creek at the Conestoga Country Club for the 1964 calendar year was 43 cfs. Approximately 77% of the total streamflow was derived from groundwater discharge. Groundwater in carbonate rocks of the Lancaster quadrangle generally has a specific conductance of between 400 and 700 micromhos per centimeter. (Woodard-USGS)
W71-09594

EVALUATION OF THE MADISON LIMESTONE IN THE WILLISTON BASIN FROM WELL LOGS AND CORES,
Bureau of Mines, Laramie, Wyo., Energy Research Center.
E. J. White, and L. C. Marchant.
Bureau of Mines Report of Investigations 7497, March 1971. 27 p, 14 fig, 4 tab, 14 ref, 2 append.

Descriptors: *Groundwater movement, *Limestones, *Aquifer characteristics, *North Dakota, *Montana, Porosity, Saturation, Core drilling, Sampling, Boreholes, Oil industry, Petrography, Cores, Chemical analysis, Physical properties, Geology, Hydrogeology, Oil-water interfaces, Water chemistry.
Identifiers: *Core analysis, *Log analysis.

Data from oil well logs and core analyses were used to quantitatively evaluate formation porosity and water saturation of heterogeneous carbonates and to study the pore geometry and performance characteristics of cores from these formations. Logs and cores from the Madison limestone from 233 wells in three fields in the Williston basin of North Dakota and Montana were used in the investigation. A comparison of log and core analyses shows that log porosities are consistently larger than core porosities, and the differences are correlatable with core porosity ranges. Water saturations from logs are usually smaller than the corresponding core saturations by summation of fluids, but the difference is attributable to mud filtrate invasion into the cores during drilling. Petrophysical studies show that the low permeabilities and high residual water saturations in these reservoir rocks are due to their fine crystalline texture and complex pore geometry (heterogeneity). It is concluded that both log and core analyses must be used for reliable evaluation of these carbonate formations. (Woodard-USGS)
W71-09595

GROUNDWATER RECONNAISSANCE STUDY OF SELECTED SITES IN ROCKY MOUNTAIN NATIONAL PARK AND SHADOW MOUNTAIN NATIONAL RECREATION AREA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 04B.

W71-09597

PRELIMINARY REPORT ON THE WATER RESOURCES OF SOUTHEAST MAUI, HAWAII,
Geological Survey, Honolulu, Hawaii.
For primary bibliographic entry see Field 02E.
W71-09598

HYDRAULIC TESTING OF THE OJO ALAMO SANDSTONE IN HOLE GB-3, PROJECT GASBUGGY, RIO ARRIBA COUNTY, NEW MEXICO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05B.
W71-09599

IMPROVEMENTS IN THE FINITE DIFFERENCE SOLUTION OF TWO-DIMENSIONAL DISPERSION PROBLEMS,
Guelph Univ. (Ontario).
For primary bibliographic entry see Field 05B.
W71-09611

FORMATION OF FRESH GROUNDWATERS IN THE KONKA-YALY DEPRESSION (Russian: O formirovani presnykh podzemnykh vod Konkso-Yalynskoy vpadiny),
Kiev State Univ. (USSR).
N. I. Drobnokhod, B. N. Mandrik, and V. S. Shabatin.
Sovetskaya Geologiya, No 3, p 98-108, March 1970. 11 p, 8 fig, 6 tab, 2 ref.

Descriptors: *Groundwater recharge, *Groundwater movement, *Aquifers, Fresh water, Connate water, Clays, Crystalline rocks, Fractures (Geology), Fissures (Geology), Demineralization, Weathering, Hydrogen ion concentration, Water chemistry, Salts.
Identifiers: *USSR, *Ukraine, Konka-Yaly depression, Mineralization, Hydrochemistry.

The recharge of aquifers in Bucha, Kiev-Kharkov, and Poltava deposits of the Konka-Yaly depression is accomplished by groundwater flow from the fissure zone of crystalline rocks of the Azov Sea massif through zones of fractures, which outline the depression on the south and east. Demineralization of the waters during groundwater infiltration through these zones results in fresh waters with a mineralization of 0.4-1.0 g/liter. Demineralization of the waters of the region may be associated with a periodic regeneration of the absorption capacity of clays in the zones of tectonic fractures. This process may be the result of (1) the formation of new clay particles owing to continual weathering of the crystalline rocks of the massif, (2) seasonal fluctuations in the amount of soluble salts in the waters and (3) a change in the acidity of inflowing waters depending upon the time of year. (Josefsen-USGS)
W71-09642

PREDICTING EARTHQUAKES BY HYDROGEOLOGICAL METHODS (Russian: K prognozirovaniyu zemletreseniy gidrogeologicheskimi metodami),
For primary bibliographic entry see Field 07B.
W71-09643

GROUNDWATER DATA AS OF 1967—CENTRAL COASTAL SUBREGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 07C.
W71-09649

GROUNDWATER DATA AS OF 1967 - SOUTH COASTAL SUBREGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 07C.
W71-09650

WATER RESOURCES OF THE SLAGLE-SIMPSON-FLATWOODS AREA, LOUISIANA, Geological Survey, Baton Rouge, La. C. D. Whiteman, Jr., A. J. Calandro, and W. L. Broussard.

Louisiana Geological Survey and Department of Public Works Water Resources Pamphlet No 24, April 1970. 23 p, 1 plate, 4 tab, 9 ref.

Descriptors: *Water resources development, *Groundwater, *Water wells, *Aquifer characteristics, *Louisiana, Water yield, Withdrawal, Specific capacity, Hydrologic data, Water utilization, Water quality, Chemical analysis, Water temperature, Data collections, Hydrogeology, Water levels, Pumping, Drawdown.

Identifiers: *Groundwater resources, *Vernon Parish (La.), *Rapides Parish (La.).

Large quantities of groundwater of good quality are available at the communities of Slagle and Simpson and in nearby areas of Vernon Parish, Louisiana. Smaller, but adequate, quantities of groundwater of good quality are available at and near Flatwoods in Rapides Parish. Yields of several hundred gallons per minute are obtainable from large-diameter wells in each of the communities. Specific capacities of properly developed large-diameter wells at Slagle and Simpson are between 5 and 30 gpm/ft of drawdown. Specific capacities of 3 to 5 gpm/ft of drawdown are obtainable at Flatwoods. At Slagle and Simpson several wells could be installed at a single location without causing mutual interference by completing each well in a different sand. At Flatwoods only one sand capable of sustaining high well yields contains water suitable for public-supply use. Streams draining the area contain water of good chemical quality but would not furnish a reliable supply unless storage facilities were developed. (Woodard-USGS)

W71-09657

MICROTIME MEASUREMENTS OF GROUNDWATER LEVEL FLUCTUATIONS, Illinois State Water Survey, Urbana. William C. Walton.

Groundwater, Vol 1, No 2, p 18-19, April 1963.

Descriptors: *Water wells, Water table, Groundwater, Aquifer characteristics.

Identifiers: *Groundwater level fluctuations, Microtime measurements, Pump tests, Methods.

Water-level measurements made during the early seconds and minutes of aquifer tests may often be used to determine the hydraulic properties of an aquifer and to locate hydrogeologic boundaries. This paper describes a method, using a modified stylus carriage and pen and a stop watch, of recording microtime water-level measurements in a well equipped with a recording gage. Ordinary and microtime records of water-level fluctuations are simultaneously obtained. Microtime water-level measurements often aid in appraising the effects of slow gravity drainage under water-table conditions and anisotropic and heterogeneous conditions. (Campbell-NWWA)

W71-09732

PREDICTING WELL YIELDS - TWO CASE HISTORIES, Patchick Consulting Hydrogeologist, White Bear Lake, Minn.

For primary bibliographic entry see Field 03B.

W71-09733

EFFECT OF PHYSICAL PROPERTIES OF POROUS MEDIA ON WATER MOVEMENT, Idaho Univ., Moscow. Dept. of Agriculture and Bio-Resources Engineering.

G. L. Bloomsburg, and W. M. Carson. Available from the National Technical Information Service as PB-201 001, \$3.00 in paper copy, \$0.95 in microfiche. Technical Completion Report, September 1970, 20 p, 5 fig, 11 ref. OWRR Project A-025-IDA (2).

Descriptors: *Permeability, Hydraulic conductivity, *Porous media, *Darcy's law, Saturated flow, *Groundwater.

Theoretical and experimental work was conducted to determine the effect of various physical properties of porous media on permeability. The theoretical work involved obtaining a solution for a linearized but complete form of the Navier Stokes equation for flow around a sphere in a rectangular array of spheres. The linearization involved making Oseen's approximation for the convective acceleration terms. The Galerkin method was used and the solution was valid up to a Reynolds number of about 10. The experimental and analytical work showed that the Darcy equation could be used over the entire range of Reynolds numbers as long as it is realized that in the so-called non-Darcy range the coefficient of permeability is dependent on Reynolds number. Experimental data are given for the permeability of various porous materials as a function of Reynolds number with porosity as a parameter.

W71-09737

USE OF THE FINITE-ELEMENT METHOD IN THE SOLUTION OF DIFFUSION-CONVECTION EQUATIONS, Texaco Inc., Bellaire, Tex.

Y. M. Shum.

Society of Petroleum Engineers Journal, Vol 11, No 2, p 139-144, June 1971. 6 p, 4 fig, 11 ref.

Descriptors: *Diffusion, *Convection, *Porous media, *Mass transport, *Heat flow, Mathematical studies, Variability, Numerical analysis, Groundwater movement.

Identifiers: *Finite difference method.

A variational principle usually applied to the transient heat conduction equation with heat-flux boundary conditions, with a slight modification of the solution technique, is also applicable to diffusion-convection equations. Consideration is given to a one-dimensional transport problem with dispersion in porous media. The finite-element method is employed to reduce the continuous spatial solution into a finite number of time-dependent unknowns. The method can readily be applied to solve problems involving either linear or nonlinear boundary conditions, or both. Results using the finite-element method are compared with several standard finite-difference numerical solutions. The finite-element method is shown to yield satisfactory solutions. (Knapp-USGS)

W71-09804

MOTION OF THE SEAWATER INTERFACE IN COASTAL AQUIFERS: A NUMERICAL SOLUTION,

Technion - Israel Inst. of Tech., Haifa.

U. Shamir, and G. Dagan.

Water Resources Research, Vol 7, No 3, p 644-657, June 1971. 14 p, 11 fig, 6 ref. Technion Grant 012-300

Descriptors: *Saline water intrusion, *Saline freshwater interfaces, *Numerical analysis, Dupuit-Forchheimer theory, Groundwater movement, Tides, Tidal effects, Water table, Hydraulic conductivity, Permeability, Computer programs, Unsteady flow.

Identifiers: Coastal aquifers.

The partial differential equations that describe the motion of the seawater interface and the free surface in a phreatic coastal aquifer (or the freshwater head replacing the latter, in the confined case) are presented. They are based on the Dupuit approximation and take into consideration the geometry of the vertical section through the aquifer, in whose plane the flow takes place, as well as the spatial variation of properties of the porous medium and the spatial and temporal distributions of accretion, recharge, and pumping. An implicit numerical scheme is presented to solve the set of simultaneous partial differential equations. The scheme is

based on a linearization of the equations and employs a grid with one spacing over the intrusion length and a different spacing in the remainder of the field. Efficient solution of the resulting set of simultaneous linear equations for each time step is achieved by arranging them in a way that results in a 7 diagonal coefficient matrix. Examples are presented, for which the numerical solutions are compared with analytical solutions or laboratory experiments. (Knapp-USGS)

W71-09813

HYDRODYNAMICS AND HYDROCARBON OCCURRENCES, SURAT BASIN, QUEENSLAND, AUSTRALIA,

Research Council of Alberta, Edmonton; and Bureau of Mineral Resources, Geology, and Geophysics, Canberra (Australia).

Brian Hitchon, and John Hays.

Water Resources Research, Vol 7, No 3, p 658-676, June 1971. 19 p, 12 fig, 28 ref.

Descriptors: *Oil fields, *Groundwater basins, *Groundwater movement, *Geochemistry, *Hydrogeology, Investigation, Surveys, Model studies, Mapping, Aquifers, Hydrodynamics, Flow nets, Distribution patterns, Potential flow.

Identifiers: *Australia, *Regional hydrodynamics.

The decision whether to continue petroleum exploration of a sedimentary basin when only marginally attractive oil and gas discoveries have been made is a difficult one, which can be assisted by the application of an appropriate fluid flow model. The pertinency of the Toth-Freeze-Witherspoon model has been proved in the western Canada sedimentary basin, and is now applied to the less explored Surat basin, Australia. The Surat basin consists of a narrow north trending trough filled with Paleozoic strata overlain by a thick, broad cover of Mesozoic sedimentary rocks. Hydraulic head maps and cross sections indicate that hydrocarbon accumulations are associated with quasistagnant portions of discharge areas in which flow is vertical with respect to the bedding, the result being increased salinity of the formation waters caused by membrane filtration and consequently conditions more favorable for the disaccommodation and subsequent accumulation of hydrocarbons. Although the detailed delineation of favorable areas in the Surat basin is difficult with the data presently available, the concepts and approach applied in this paper may be of value to those seeking hydrocarbon accumulations in sedimentary basins throughout the world. (Knapp-USGS)

W71-09817

SEEPAGE THROUGH UNCONFINED AQUIFERS WITH LOWER BOUNDARIES OF ANY SHAPE,

Agricultural Research Council, Cambridge (England). Unit of Soil Physics.

E. G. Youngs.

Water Resources Research, Vol 7, No 3, p 624-631, June 1971. 8 p, 8 fig, 8 ref.

Descriptors: *Groundwater movement, *Seepage, *Underseepage, *Aquicludes, Dams, Canals, Canal seepage, Soil water movement, Saturated flow, Unsaturated flow, Equations, Porous media, Hydraulic conductivity, Water table, Saline water intrusion, Boundary processes, Dupuit-Forchheimer theory, Stratified flow.

Identifiers: Unconfined aquifers.

Seepage through unconfined aquifers with lower boundaries of any shape is analyzed. The differential equation describing the flow includes a term that involves the pressure distribution on the lower boundary. Although in many problems all the required pressure distribution that enable the seepage problem to be solved are not known exactly, inspection of a given problem gives extreme values of any unknown terms with a final result of known precision. The application of the analysis, checked by electric analog experiments, is illustrated by two examples of seepage problems: first,

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Group 2F—Groundwater

the seepage over an inclined plane between two parallel ditches; and second, the seaward flow of freshwater fed by a freshwater reservoir or by rainfall and supported on saline water from the sea. (Knapp-USGS)
W71-09822

USE OF HARMONIC ANALYSIS TO STUDY TIDAL FLUCTUATIONS IN AQUIFERS NEAR THE SEA,

Department of Energy, Mines and Resources, Ottawa (Ontario), Inland Waters Branch.
P. A. Carr.

Water Resources Research, Vol 7, No 3, p 632-643, June 1971. 12 p, 6 fig, 8 tab, 15 ref.

Descriptors: *Surface-groundwater relationships, *Tides, *Aquifer characteristics, *Groundwater movement, *Fourier analysis, Waves (Water), Hydraulic conductivity, Permeability, Confined water, Hydrogeology, Time lag.
Identifiers: *Aquifer tests, Harmonic analysis, *Prince Edward Island.

Sixteen days of water level records were collected from a tidal gage and from four wells situated in a line perpendicular to the shore at Borden, Prince Edward Island, Canada. These two sets of records were separated by harmonic analysis into three tidal components. In a confined aquifer, groundwater flow obeys linear potential theory so that each directional component represents a distinct hydraulic conductivity and specific storage test on the aquifer. The use of a line of wells permits the determination of the effective distance and an accurate determination of true tidal efficiency by two different plots. The values of hydraulic conductivity determined this way agree very closely with the values determined by packer tests on nearby wells. The unseparated composite wave was analyzed by using the maxima and minima from four days of records and by assuming a periodicity of 745 minutes. The calculated values of aquifer parameters differed very little from those determined by the individual components. The individual analyses can however produce large errors because they do not permit an accurate determination of the effective distance. (Knapp-USGS)
W71-09824

ANALYSIS OF NONSTEADY FLOW WITH A FREE SURFACE USING THE FINITE ELEMENT METHOD,

Volcani Inst. of Agricultural Research, Bet Dagan (Israel); and California Univ., Berkeley. Dept. of Civil Engineering.

Shlomo P. Neuman, and Paul A. Witherspoon.
Water Resources Research, Vol 7, No 3, p 611-623, June 1971. 13 p, 7 fig, 33 ref.

Descriptors: *Unsteady flow, *Groundwater movement, *Water table, *Numerical analysis, *Saturated flow, Mathematical models, Drawdown, Aquifers, Aquifer characteristics, Computer programs, Withdrawal, Water storage, Groundwater recharge, Specific yield, Porous media, Permeability, Storage coefficient, Discharge (Water), Mathematical studies.

Identifiers: Nonsteady free surface flow, Finite element method.

A new iterative, numerical approach to nonsteady flow of groundwater with a free surface using the finite element method has been developed. The method is unconditionally stable and therefore requires only a small number of time steps to reach the steady state. It can handle problems in which the free surface is discontinuous and portions of the free surface are vertical or nearly vertical. Infiltration or evapotranspiration at the free surface is handled with ease, and the effect of the unsaturated zone can be taken into account indirectly by using the concept of delayed yield from storage. In addition to gravity drainage, the method takes into consideration storage due to the elastic properties of the saturated porous medium. In problems involving flow to a well operating at a prescribed rate,

both storage in the well and the actual distribution of velocities along the well bore are taken into account. The method can be applied to a wide variety of problems involving complex boundaries and arbitrary degrees of heterogeneity and anisotropy. Several examples are included to demonstrate some of the features of this new approach. (Knapp-USGS)
W71-09826

LOW RESISTIVITY ON ELECTRIC LOG COULD MEAN 'CHERT',

Schlumberger Well Surveying Corp., Tulsa, Okla.

For primary bibliographic entry see Field 04B.
W71-09906

2G. Water in Soils

A GAMMA ATTENUATION UNIT AND LOGISTIC SYSTEM FOR MONITORING WATER CONTENT OF LARGE SOIL COLUMNS,

North Dakota State Univ., Fargo, Dept. of Soils.

For primary bibliographic entry see Field 07B.
W71-09614

A STATISTICAL METHOD FOR ANALYSIS OF DIFFUSION IN SOILS,

Cold Regions Research and Engineering Lab., Hanover, N.H.

Y. Nakano, and R. P. Murrmann.

Soil Science Society of America Proceedings, Vol 35, No 3, p 397-402, May-June 1971. 6 p, 4 fig, 20 ref.

Descriptors: *Diffusion, *Soil water movement, *Statistical methods, *Mass transfer, Soil physical properties, Soil chemistry, Monte Carlo method, Pesticide residues, Path of pollutants, Frozen soils, Ion transport.

A special Monte Carlo method for use in investigating problems which involve random processes is developed. This approach differs from the usual Monte Carlo method for solution of differential equations in that the random process itself is constructed directly. The power of this approach is demonstrated by application of the method using two examples. In one case, the effect of thermal gradient on ionic diffusion through thin films of interfacial water in frozen clay is examined. The predicted ionic distribution is in agreement both with experimental data and with the result obtained by exact solution of the diffusion equation. In the second example, the distribution of acetone deposited in soil near the soil-atmosphere interface is calculated for a two-layer profile in which the adsorption coefficient and void-porosity vary between horizons. (Knapp-USGS)
W71-09615

ISOTOPICALLY EXCHANGEABLE COBALT: THE EFFECT OF SOIL pH AND IONIC SATURATION OF THE SOIL,

Missouri Univ., Columbia. Dept. of Agronomy.

For primary bibliographic entry see Field 02K.
W71-09617

CALCULATION OF THE LEACHING REQUIRED TO REDUCE THE SALINITY OF A PARTICULAR SOIL DEPTH BENEATH A SPECIFIED VALUE,

California Univ., Berkeley. Dept. of Soils and Plant Nutrition.

Richard W. Terkelstou, and K. L. Babcock.

Soil Science Society of America Proceedings, Vol 35, No 3, p 411-414, May-June 1971. 4 p, 4 fig, 2 tab, 9 ref.

Descriptors: *Leaching, *Saline soils, *Irrigation water, *Land reclamation, Water quality, Water chemistry, Mineralogy, Gypsum, Soil chemistry.
Identifiers: Soil salinity.

Soil columns containing either Yolo silty clay loam or Hanford sandy loam were prepared with vertically nonuniform salt (Na, Ca, Mg, Cl) and moisture distributions and with gypsum present in the surface soil. The columns were irrigated at both fast and slow rates of water application with a water containing Na, Ca, Mg, and Cl. A simple method for calculating salt movement in soils successfully approximated the resultant salt profiles. A variation in the salt movement computation method was devised for calculating the leaching required to lower the salinity of a particular soil depth to less than a specified value. The method was experimentally verified on both a Yolo and a Hanford soil column, each with vertically nonuniform initial salt and moisture distributions. (Knapp-USGS)
W71-09618

INTRODUCTION TO SYMPOSIUM—THE SOIL SOLUTION,

Agricultural Research Service, Auburn, Ala. Soil and Water Conservation Research Div.

Robert W. Pearson.

Soil Science Society of America Proceedings, Vol 35, No 3, p 417-420, May-June 1971. 4 p, 7 fig, 1 tab, 13 ref.

Descriptors: *Conferences, *Soil water, *Soil chemistry, *Water chemistry, Soil-water-plant relationships, Soil environment, Aqueous solutions, Chemical potential.
Identifiers: *Soil solution.

During the 1970 annual meeting of SSSA, August 23-28, at the University of Arizona, Tucson, a symposium was held on the subject of the soil solution. The symposium program consisted of seven papers by society members who have been concerned for many years with the need to clarify the role which the soil solution plays in the chemical reactions within the soil and its contribution to plant growth. Evidence is presented for validity of the concept of soil solution composition as a useful reflection of soil chemical environment that can be related to plant-root growth. Analysis of soil extracts does not give the same information. Samples of the soil solution can be obtained by displacement at any desired moisture level. (Knapp-USGS)
W71-09619

IONIC CONCENTRATIONS AND ACTIVITIES IN THE SOIL SOLUTIONS,

Auburn Univ., Ala. Dept. of Agronomy and Soils.

Fred Adams.

Soil Science Society of America Proceedings, Vol 35, No 3, p 420-426, May-June 1971. 7 p, 4 tab, 15 ref.

Descriptors: *Water chemistry, *Soil water, *Soil chemistry, *Aqueous solutions, Hydrolysis, Ions, Chemical reactions, Mineralogy, Computer programs, Chemical potential.
Identifiers: *Soil solutions.

The chemical composition of displaced soil solutions is used to illustrate the procedure for correcting measured ionic concentrations to actual ionic concentrations and ionic activities. The procedure distributes soil-solution electrolytes at equilibrium among their various ionic species by using equations for ion-activity coefficients, ion-pair dissociation, weak-acid and weak-base dissociation, and hydrolysis. More than 20 related equations had to be solved simultaneously; thus, mathematical solution was effected through the method of successive approximation. Rapid correction of soil-solution analytical data to actual concentrations and activities of individual soil-solution ions was made possible by using a computer program. (Knapp-USGS)
W71-09620

SOLUTION OF ION ACTIVITY AND PLANT GROWTH,

Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Agricultural Development.
F. E. Khasawneh.

Soil Science Society of America Proceedings, Vol 35, No 3, p 426-436, May-Jun 1971. 11 p, 7 fig, 1 tab, 87 ref.

Descriptors: *Soil chemistry, *Water chemistry, *Aqueous solutions, *Soil-water-plant relationships, *Adsorption, Moisture uptake, Ion exchange, Phosphates, Chemical potential.
Identifiers: Soil solutions.

The relation of ion uptake to soil solution composition is discussed. Uptake of a given ion depends not only on its activity in solution, but also on the activity of other ions and the relation that exists between solution ions and exchangeable or solid-phase ions. Methods of combining all these factors are reviewed and evaluated. A dimensionless plot relates relative plant growth to the ratio of the ion activity to the sum of ion activities in solution, and seems to have a wide range of applicability that extends from uptake from a nutrient solution in a beaker to uptake from soil solution in situ. (Knapp-USGS)

W71-09621

COMPUTATION OF SOIL SOLUTION COMPOSITION VARIATION WITH WATER CONTENT FOR DESATURATED SOILS, Agricultural Research Service, Riverside, Calif. Salinity Lab.
J. D. Oster, and B. L. McNeal.

Soil Science Society of America Proceedings, Vol 35, No 3, p 436-442, May-Jun 1971. 7 p, 2 fig, 7 tab, 21 ref.

Descriptors: *Water chemistry, *Soil water, *Soil chemistry, *Aqueous solutions, *Mathematical models, Computer programs, Mineralogy, Calcite, Cation exchange, Simulation analysis, Electrical conductance, Gypsum, Ion exchange, Chemical potential.
Identifiers: Ionic activity coefficients.

Mathematical models were evaluated which calculate the change in soil solution composition and electrical conductivity as water content is changed by evaporation or extraction by plants. Two models included consideration of precipitation of salts, cation exchange, soil pH buffer capacity, ionic activities, sulfate, bicarbonate and carbonate ion pairs of calcium, sodium, and magnesium, and partial pressure of carbon dioxide. A third model included only the ion pair calcium sulfate. The reliability of the models was evaluated by comparing electrical conductivities measured by in situ salinity sensors with calculated conductivities. The best model considered the maximum number of ion pairs and used a form of the Debye-Huckel equation with individual ion parameters. This model resulted in an average difference between calculated and measured values of 1.1 mmho/cm, an error of 6% when compared to the average measured value of 17.1% mmho/cm. (Knapp-USGS)

W71-09622

PROBLEMS ASSOCIATED WITH THE DETERMINATION AND APPLICATION OF THE SOLUBILITY PRODUCT CONSTANT, Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
F. S. Nakayama.

Soil Science Society of America Proceedings, Vol 35, No 3, p 442-445, May-Jun 1971. 4 p, 2 fig, 23 ref.

Descriptors: *Aqueous solutions, *Water chemistry, *Soil water, *Soil chemistry, *Solubility, Chemical potential, Calcium, Carbonates, Phosphates, Sulfates, Gypsum, Calcite, Ions, Equilibrium, Hydrolysis.
Identifiers: *Solubility product.

Difficulties encountered in estimating the solubility product constants of $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ and CaCO_3 from analytical measurements are discussed. A major factor involved in this formation of complexes between the constituents of the dissolving

solid and other ionic species in solution. Conversely, when the solubility product principle using these constants is applied for predicting the precipitation of ions or the dissolution of a solid in fairly dilute solutions containing various ionic constituents, adequate accounting of all possible combinations of ion association must be made. Prediction problems are still present for solutions at high salt concentrations. (Knapp-USGS)

W71-09623

A STUDY OF WEATHERING IN A SOIL DERIVED FROM A BIOTITE-HORNBLÉNDE ROCK, I. WEATHERING OF BIOTITE, Macaulay Inst. for Soil Research, Aberdeen (Scotland).
M. J. Wilson.

Clay Minerals, Vol 8, No 3, p 291-303, July 1970. 13 p, 4 fig, 1 plate, 4 tab, 25 ref.

Descriptors: *Soil formation, *Weathering, *Clay minerals, *Ion exchange, *Leaching, Differential thermal analysis, Magnesium, Iron, Adsorption, Chemical analysis, Mineralogy.
Identifiers: *Mica weathering.

The weathering of biotite in a sedentary soil profile developed on biotite-hornblende-rock near Rehiran, Inverness-shire, Scotland, was investigated by optical, X-ray, chemical, infrared and differential thermal methods. In the C horizon a direct transformation to hydrobiotite was observed. This involves oxidation of all the ferrous iron present and subsequent movement of ferric ions from the octahedral sheet. In the B horizon weathering proceeds to a fully expanded 14A phase and this was identified as interstratified vermiculite-chlorite in a 1:1 ratio. Chemical analysis indicates that this stage is accompanied by a substantial addition of magnesium, much of which goes to form the brucite-like interlayers. In the more acid surface horizon these interlayers tend to break down thus yielding a more vermiculitic product. The possible general implications of this type of biotite weathering are briefly discussed. (See also W71-09636) (Knapp-USGS)

W71-09635

A STUDY OF WEATHERING IN A SOIL DERIVED FROM A BIOTITE-HORNBLÉNDE ROCK, II. THE WEATHERING OF HORNBLÉNDE, Macaulay Inst. for Soil Research, Aberdeen (Scotland).
M. J. Wilson, and V. C. Farmer.

Clay Minerals, Vol 8, No 4, p 435-444, December 1970. 10 p, 6 fig, 3 tab, 18 ref.

Descriptors: *Weathering, Soil formation, *Leaching, *Ion exchange, *Clay minerals, Clays, Soil chemistry, Mineralogy, Expansive clays, Chemical reactions.
Identifiers: Biotite, Hornblende.

The weathering of hornblende was investigated by optical, X-ray, infrared and differential thermal methods. Optical studies of the fresh hornblende show that it contains discrete lamellar intergrowths of another amphibole which, from infrared evidence, is of an iron-rich nature. This minor phase is selectively weathered in the lower horizons and yields a clay mineral which was identified as interstratified swelling chlorite-saponite. The major hornblende component remains relatively unchanged. Single crystal photographs indicate that the formation of the clay mineral is not structurally controlled by the parent hornblende, although there is a tendency towards alignment along cleavage planes. The clay mineral becomes unstable in the upper part of the profile and could not be detected in the A horizon. (See also W71-09635) (Knapp-USGS)

W71-09636

THE ADSORPTION OF POLY (ETHYLENE GLYCOLS) ON CLAY MINERALS, Adelaide Univ. (Australia). Waite Agricultural Research Inst; and Adelaide Univ. (Australia). Dept. of Agricultural Biochemistry and Soil Science.

R. L. Parfitt, and D. J. Greenland.

Clay Minerals, Vol 8, No 3, p 305-315, July 1970. 11 p, 5 fig, 4 tab, 17 ref.

Descriptors: *Adsorption, *Clay minerals, *Alcohols, Free energy, Cation exchange, Cesium, Sodium, Calcium, Aluminum, Ion exchange, Hydration.
Identifiers: Poly (Ethylene glycols).

Poly (ethylene glycols) of molecular weights 200 to 2000 were strongly adsorbed on montmorillonite from aqueous solution. Free energies of adsorption calculated from the adsorption isotherms became more negative with increase in molecular weight and the entropy change became increasingly positive, probably due to a net desorption of water from the clay surface as the organic compound was adsorbed. The adsorption of the higher molecular weight polymers caused an increase in the interlamellar separation. The effect of the exchangeable cation on the adsorption followed the order Cs, Na, Ca, Al, indicating that the cation retained its hydration shell and did not form a direct association with the adsorbed organic molecules. Some evidence was obtained that 'water bridges' were formed between exchangeable calcium an aluminium ions and the ether groups of the polymers. (Knapp-USGS)

W71-09637

ADSORPTION OF WATER BY MONTMORILLONITE - POLY (ETHYLENE GLYCOL) ADSORPTION PRODUCTS, Adelaide Univ. (Australia). Waite Agricultural Research Inst., and Adelaide Univ. (Australia). Dept. of Agricultural Biochemistry and Soil Science.

R. L. Parfitt, and D. J. Greenland.

Clay Minerals, Vol 8, No 3, p 317-324, July 1970. 8 p, 4 fig, 2 tab, 18 ref.

Descriptors: *Adsorption, *Clay minerals, *Alcohols, Free energy, Cation exchange, Cesium, Sodium, Calcium, Aluminum, Ion exchange, Hydration.
Identifiers: Poly (Ethylene glycols).

Water adsorption by interlamellar complexes of poly (ethylene glycols) (PEG) and montmorillonite has been determined using a silica spiral spring, and supplementary data obtained by X-ray and infrared techniques. The adsorbed water enters the interlamellar region, where it is associated with the exchangeable cation. The lattice swells to accommodate the intercalated water. Only weak hydrogen bonds are formed between the surface of the clay and the adsorbed water or between adsorbed PEG molecules and adsorbed water. The presence of PEG did not prevent extensive swelling of sodium montmorillonite. (Knapp-USGS)

W71-09638

THE FORMATION OF STABLE SOLS FROM LAPONITE, A SYNTHETIC HECTORITE-LIKE CLAY, Laporte Industries Ltd., Redhill (England).
B. S. Neumann, and K. G. Sansom.

Clay Minerals, Vol 8, No 4, p 389-404, December 1970. 16 p, 18 fig, 5 tab, 2 ref.

Descriptors: *Clay minerals, *Suspension, *Colloids, *Electrolytes, *Expansive clays, Gels, Phosphates, Water chemistry.
Identifiers: *Sols.

The effects of simultaneous additions of electrolyte and peptizer to dispersion of the synthetic hectorite-like clay, Laponite, have been studied. Unexpectedly, whereas many cations cause gelling and flocculation of the dispersions as expected by col-

Field 02—WATER CYCLE

Group 2G—Water in Soils

loid chemical theory, some cations actually stabilize the soils obtained with peptizer. A relationship was found between the effectiveness of the cations in increasing soil stability and their size and charge. The effects of time, temperature and peptizer concentration were examined. The explanations offered for this phenomenon are based on the idea that the stabilizing cations cause oriented flocculation and, consequently, a reduction of the number of particles available for structure formation. (Knapp-USGS)

W71-09639

LIMITATIONS ON SCALING BY CONTACT ANGLE,

Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.

J. R. Philip.

Soil Science Society of America Proceedings, Vol 35, No 3, p 507-509, May-June 1971. 3 p, 2 fig, 8 ref.

Descriptors: *Infiltration, *Wetting, *Soil water movement, Capillary water, Soil physical properties, Model studies.

Identifiers: Contact angle (Capillary), Hydraulic scaling.

The prevalent notion that the (static and dynamic) behavior of liquids in porous media such as soils may be scaled by the contact angle depends on the over-simplification that such media are bundles of long cylindrical capillaries. Observations on such media yield, at best, apparent contact angles which cannot be related directly to contact angle at interfaces within the medium. In some circumstances scaling by apparent contact angle may hold approximately, but this is of only limited value, since apparent contact angle depends not only on the true liquid-solid contact angle, but also on properties of the internal geometry of the medium. These matters are illustrated through the counter-example of a (somewhat more realistic) conical-pore model. (Knapp-USGS)

W71-09806

EXTRACTION OF ANIONS AND CATIONS FROM RECENT VOLCANIC ASH,

Inter-American Inst of Agricultural Sciences, Turrialba (Costa Rica). Research and Training Center. Elemer Bornemisza.

Soil Science Society of America Proceedings, Vol 35, No 3, p 506-507, May-June 1971. 2 p, 1 fig, 1 tab, 4 ref. USAEC Contract AT (30-1)2043

Descriptors: *Leaching, *Anion exchange, *Volcanoes, Soil chemistry, Water chemistry, Calcium, Magnesium, Sodium, Manganese, Sulfates, Silicates, Ion transport, Salts, Soil water, Solubility.

Identifiers: *Volcanic ash.

Water extracts of ash from Mt. Arenal, Costa Rica's most recently active volcano, contained up to 32 ppm Ca, 3.3 ppm Mg, 4ppm K, 4 ppm Na, and 0.4 ppm Mn. No phosphates were extracted by water, but sulfates reached 35 ppm and silicates 1.6 ppm in the extracts. The sample farthest away from the volcano gave extracts of lowest Ca and Mg content. The pH of diluted NaOH suspension of ash decreased on standing by up to 1.5 pH units. (Knapp-USGS)

W71-09807

FURROW INFILTRATION RATES AS AFFECTED BY INCORPORATION OF STRAW OR FURROW CULTIVATION,

Agriculture Research Service, Prosser, Wash. Soil and Water Conservation Research Div. D. E. Miller, and J. S. Aarstad.

Soil Science Society of America Proceedings, Vol 35, No 3, p 492-495, May-June 1971. 4 p, 1 fig, 4 tab, 8 ref.

Descriptors: *Infiltration, *Mulching, *Furrow irrigation, *Soil structure, *Cultivation, Soil

management, Water utilization, Irrigation water, Furrows, Irrigation practices, Soil treatment. Identifiers: Furrow infiltration.

Either straw incorporation or cultivation of the furrow bottom greatly increased furrow infiltration into a sandy loam soil during a 3-year study period. Straw incorporation became less effective as the season progressed. A single straw application of 13.4 tons/ha lasted until midway into the second irrigation season. The cultivation treatment caused serious erosion when furrow inflow rates were about 6 liters/min or more. The straw prevented erosion at all inflow rates (up to 8 liters/min). Organic matter contents were significantly increased by the incorporation of straw. Aggregate stabilities followed the same trend, but differences were not statistically significant. (Knapp-USGS)

W71-09808

EFFECT OF ADDED SALT ON NITROGEN MINERALIZATION IN THREE CALIFORNIA SOILS,

California Univ., Davis. Dept. of Soils and Plant Nutrition.

F. E. Broadbent, and T. Nakashima.

Soil Science Society of America Proceedings, Vol 35, No 3, p 457-460, May-June 1971. 4 p, 4 fig, 5 tab, 5 ref.

Descriptors: *Nitrogen fixation, *Chemical precipitation, *Nitrogen compounds, *Soil chemistry, *Soil water, Water chemistry, Ammonia, Sulfates, Chlorides, Calcium, Potassium. Identifiers: *Nitrogen mineralization.

The effect of ammonium sulfate, ammonium chloride, potassium chloride, calcium chloride, aluminum chloride, and copper sulfate, added in amounts corresponding to 0.2, 2, and 20 atm concentration, on mineralization of soil nitrogen in three soils was measured over a 30-day period. Significant increases were produced by the ammonium salts which were labeled with N-15 to allow distinction between added and soil nitrogen. In Aiken clay loam, nitrogen mineralization was also increased by solutions of potassium chloride, calcium chloride, and aluminum chloride, but in Altamont clay loam and in Mormon clay, increases were not consistent. Copper sulfate depressed nitrogen mineralization in all soils. The quantity of organic nitrogen brought into solution was related to the concentration of salt solution. (Knapp-USGS)

W71-09809

THE ROLE OF SPARINGLY SOLUBLE SOLIDS AND CATION EXCHANGE REACTIONS IN CONTROLLING CONDITIONS IN SOIL SOLUTIONS,

Department of Agriculture, Ottawa (Ontario). Soil Research Inst.

R. C. Turner, and S. Shad Singh.

Soil Science Society of America Proceedings, Vol 35, No 3, p 445-449, May-June 1971. 5 p, 2 fig.

Descriptors: *Aqueous solutions, *Water chemistry, *Solubility, *Soil water, Soil chemistry, Chemical potential, Aluminum, Ion exchange, Clay minerals, Equilibrium, Hydrolysis.

Identifiers: Aluminum hydroxides, *Solubility product, Soil solution.

The application of the principle of solubility products of relatively insoluble solids and exchange reactions to soil problems are discussed. The examples used concern the solubility products of hydroxylaluminum solids, whether thermodynamically stable or metastable, and exchange reactions with clay surfaces involving aluminum and calcium ions. (Knapp-USGS)

W71-09810

2H. Lakes

PHOSPHATE MEASUREMENTS IN NATURAL WATERS, A CRITIQUE,

Minnesota Univ., Minneapolis. Limnological Research Center.

For primary bibliographic entry see Field 05A.

W71-09557

PHYTOPLANKTON DYNAMICS AND PRODUCTIVITY IN A SHALLOW, HIGHLY EUTROPHIC LAKE: WITH SPECIAL REFERENCE TO MELOSIRA AMBIGUA (GRUN.) O. MULL. AND M. GRANULATA (EHR.) RALFS,

Wisconsin Univ., Madison. Water Resources Center.

For primary bibliographic entry see Field 05C.

W71-09561

RADIATION REGIME OF LAKES AND RESERVOIRS (Russian: Radiatsionnyy rezhim ozer i vodokhranilishch),

T. V. Kirillova.

Leningrad, Gidrometeoizdat, 1970. 253 p, 67 fig, 132 tab, 331 ref.

Descriptors: *Radiation, *Albedo, *Bodies of water, *Lakes, *Reservoirs, Solar radiation, Sun, Cloud cover, Meteorological data, Climatology, Air temperature, Atmosphere, Atmospheric physics, Humidity, Coasts, Weather data, Air-water interfaces, Air-earth interfaces, Heat balance, Seasonal.

Identifiers: *USSR, Volgograd reservoir, Novosibirsk reservoir, Lake Sevan, Radiation balance, Water surface, Total radiation, Effective radiation, Radiometers, Actinometry.

Contrary to popular belief, the total radiation above reservoirs and lakes during a summer period is greater than that above coastal areas. The difference is approximately 5% and may be attributed to the presence of fewer clouds and a greater atmospheric transparency above water bodies. The observed values of albedo exceed the theoretically computed values whenever the altitude of the sun is greater than 30 deg and are smaller than the computed values when the altitude of the sun is less than 30 deg. Changes in absorbed and effective radiation point to their close relationship and reveal their dependence upon the sun's altitude. A method is given for determining the water surface temperature, air temperature, and humidity above a water body based on meteorological observations on the shore. The method makes it possible to calculate the radiation balance of planned water bodies of various depth and size and to refine quantitative descriptions of the hydrometeorological regime of lakes and reservoirs. (Josefson-USGS)

W71-09647

PHYSICAL (HYDRAULIC) MODELING OF HEAT DISPERSION IN LARGE LAKES: A REVIEW OF THE STATE OF THE ART,

Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.

For primary bibliographic entry see Field 05B.

W71-09651

SEWDISH SCIENCE: SAYING WHAT SHOULD BE DONE,

Lund Univ. (Sweden).

For primary bibliographic entry see Field 05G.

W71-09686

NEW LIFE FOR 'MINI-LAKE ERIES',

Wisconsin Dept. of Natural Resources, Madison.

For primary bibliographic entry see Field 05F.

W71-09693

MINERALIZATION OF ORGANIC PHOSPHORUS IN OLIGOTROPHIC LAKE SEDIMENTS, Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 05C.
W71-09738

SPECIFIC COMPOSITION OF PHYTOPLANKTON IN A LAKE WARMED UP BY WASTE-WATER FROM A THERMAL POWER STATION AND IN LAKES WITH NORMAL TEMPERATURES, Instytut Rybactwa Środladowego, Olsztyn-Kortowo (Poland).
For primary bibliographic entry see Field 05C.
W71-09767

2I. Water in Plants

FLUORESCENT DYES, THEIR UPTAKE AND TRANSLOCATION IN PLANTS, Geological Survey, Menlo Park, Calif. Water Resources Div.
D. E. Donaldson, and T. W. Robinson.
Water Resources Research, Vol 7, No 3, p 692-696, June 1971. 5 p, 2 fig, 1 tab, 13 ref.

Descriptors: *Tracers, *Dye releases, *Soil-water-plant relationships, *Tracking techniques, Fluorometry, Absorption, Moisture uptake, Translocation.
Identifiers: *Fluorescent dyes.

Of seven fluorescent dyes tested, rhodamine WT (RWT) and pontacyl brilliant pink (PBP) were the only two found to be suitable for tracer studies of water movements in plants. The results indicate that RWT is superior to PBP. The dyes were introduced in the aqueous form into the root zone of plants and were rapidly absorbed and transported to the leaves. The dosages were 1, 2, and 5 grams of dye per 32 kg of soil. With the largest dosage, the dye could be observed visually in the leaves. The concentrations of dye per gram of plant tissue ranged from 5 micrograms of PBP in oleander plants to 323 micrograms of RWT in fir plants. The time that elapsed from introduction of the dye into the soil until its detection in the leaves varied from 4 to 24 hours. Neither RWT nor PBP had produced any observable adverse effects when the plants were inspected up to 160 days after injection. Interference by the plant material in measuring the dye concentration was not a problem. (Knapp-USGS)
W71-09815

2J. Erosion and Sedimentation

THE FLOW OF WATER OVER AND WITHIN A PROTECTIVE LAYER OF COARSE, GRANULAR MATERIAL, Mississippi State Univ., State College. Dept. of Agricultural and Biological Engineering.
For primary bibliographic entry see Field 08B.
W71-09558

THE SLOPE OF ABYSSAL PLAINS, Flinders Univ., Bedford Park (Australia). Horace Lamb Center for Oceanographical Research.
John A. T. Bye.
Journal of Geophysical Research, Vol 76, No 18, p 4188-4194, June 20, 1971. 7 p, 1 fig, 2 tab, 6 ref.

Descriptors: *Continental slope, *Sedimentation, *Slopes, *Density currents, *Turbidity currents, Suspended load, Sediment transport, Topography, Geomorphology, Mathematical models, Slope stability, Sedimentary structures, Oceanography.
Identifiers: *Abyssal plains.

If the abyssal plains have been formed by the transport of material in suspension flows, the slopes of the plains must be consistent with the dynamics of

the flows. A solution of the momentum and conservation equations predicts a critical bottom slope below which the slopes are not self-sustaining in the presence of bottom friction even for particles with negligible fall speed. Two types of flow, in which either the depth or the concentration is held constant, both yield critical slopes of the order 1/1000. It appears that for slopes less than this value deposition of material must occur. The region of deposition may be shown to extend at least a few hundred kilometers. Thus suspension flow provides a suitable mechanism for the formation of surfaces with the observed range of abyssal slopes. (Knapp-USGS)
W71-09604

INTERSTITIAL DIFFUSION AND ADVECTION OF SOLUTE IN ACCUMULATING SEDIMENTS, Weizmann Inst. of Science, Rehvoth (Israel). Isotope Dept.
Y. Tzur.
Journal of Geophysical Research, Vol 76, No 18, p 4208-4211, Jun 20, 1971. 4 p, 1 tab, 7 ref.

Descriptors: *Mathematical models, Deposition (Sediments), *Connate water, *Diffusion, *Advection, Sedimentation, Water chemistry, Mixing, Sediment-water interfaces, Dispersion, Porous media.
Identifiers: Interstitial diffusion.

A mathematical model for diffusion and advection in accumulating sediments is presented. The model's influence on material transport and concentration is discussed; it is concluded that using simpler models by neglecting the advective terms is justified, but cases could arise in which these terms would be of importance. (Knapp-USGS)
W71-09606

DOES UPWARD DIFFUSION SUPPLY THE EXCESS MANGANESE IN PELAGIC SEDIMENTS, Lamont-Doherty Geological Observatory, Palisades, N.Y.
Michael L. Bender.
Journal of Geophysical Research, Vol 76, No 18, p 4212-4215, Jun 20, 1971. 4 p, 3 fig, 1 tab, 17 ref.

Descriptors: *Manganese, *Bottom sediments, *Diffusion, *Sediment-water interfaces, *Water chemistry, Connate water, Sedimentation, Mixing, Dispersion, Porous media.

Simple calculations indicate that upward diffusion of Mn through pelagic sediment pore water can supply manganese at the rate it has been observed to accumulate in pelagic sediments (about 1 mg per sq cm per thousand years) only if manganese needs to be transported less than a meter or so in the sediment column. Data for manganese concentrations of sediment versus depth in the core indicate that the average thickness of the manganese-rich zone of pelagic sediments is at least 10 meters; therefore upward diffusion does not supply a large portion of the 'excess' manganese in most manganese-rich pelagic sediments. (Knapp-USGS)
W71-09607

CONSEQUENCES OF HISTORIC RAINFALL ON WESTERN IOWA FARMLAND, Agricultural Research Service, Columbia, Mo. Soil and Water Conservation Research Div.
R. G. Spomer, H. G. Heinemann, and R. F. Piast.
Water Resources Research, Vol 7, No 3, p 524-535, Jun 1971. 12 p, 6 fig, 4 tab, 4 ref.

Descriptors: *Iowa, *Soil erosion, *Rainfall-runoff relationships, *Sheet erosion, *Erosion control, Storm runoff, Topography, Gully erosion, Historic flood, Cloud bursts, Cultivated lands, Damages, Land management, Sediment yield, Contour farming, Land forming, Terracing, Water control.
Identifiers: *Historic storm (Iowa).

Rainfall on five soil and water conservation watersheds near Treynor, Iowa, varied from 18 to 22 inches for the period of May 28 to June 27, 1967. This unique series of events has a return period that exceeds 100 years, based on the 97-year Weather Bureau record at nearby Omaha, Nebraska. Surface runoff from two corn cropped watersheds planted on an approximate contour approached or exceeded 50% of the storm rainfall during the period. Surface runoff was 8% or less for all rainfall events on a corn cropped, terraced watershed and 17% or less for all but one storm on a grassed watershed. These rains occurred a few weeks after planting when the corn crops were only 6 inches tall; consequently, little or no erosion protection was provided for the bare, loose soil. Sheet rill erosion rates were 75 to 100 tons per acre on the contoured watersheds. By contrast, conservation practices on two other watersheds limited the sheet rill erosion to 2.5 tons per acre. Gullies on the contoured corn watersheds eroded severely, whereas conservation practices on the other watersheds reduced gully erosion to an insignificant amount. (Knapp-USGS)
W71-09609

TRANSVERSE EROSIONAL MARKS OF MUD AND ROCK: THEIR PHYSICAL BASIS AND GEOLOGICAL SIGNIFICANCE, Reading Univ. (England). Sedimentology Research Lab.; and Reading Univ. (England). Dept. of Geology.
J. R. L. Allen.
Sedimentary Geology, Vol 5, No 3-4, p 167-385, May 1971. 219 p, 106 fig, 441 ref, 11 tab.

Descriptors: *Sedimentary structures, *Ripple marks, *Scour, *Erosion, Turbidity currents, Open channel flow, Sedimentation, Waves (Water), Beaches, Sediment transport, Channel morphology, Bed load, Bottom sediments, sediment-water interfaces, Mass transfer, Aqueous solutions, Paleohydrology, Sedimentology.
Identifiers: *Transverse erosional marks.

Transverse erosional marks of interest in the earth sciences are described and classified as individual structures and as assemblages on the basis of their field occurrence and character. A theoretical and experimental investigation is made into the physical nature of the hydrodynamic and mechanical processes involved in their production, with particular reference to the flutes and scallops produced by solution in limestone caves, and to the scour and flute marks generated on mud beds by aqueous streams, notably turbidity currents, through corrosion and fluid-stressing. The association of transverse erosional marks with separated flows is established and the relevance of the properties of these flows to the shape and growth of the marks is demonstrated in detail. Alternative explanations of the size, shape and pattern of erosional marks are considered, and the changes in these properties down a turbidity current path are explored. No single theory of size, shape and pattern yet exists, though some generalizations are possible. Erosional marks generated on limestone surfaces by solution and on strong mud beds by corrosion depend for character on the defects existing in the bed, the duration of the eroding process, and the flow properties. However, structures produced by the fluid-stressing of weakly cohesive mud beds depend on flow properties alone. In both cases inferences of importance to environmental interpretations can be made from measurable properties of the structures. (Knapp-USGS)
W71-09624

A STUDY OF WEATHERING IN A SOIL DERIVED FROM A BIOTITE-HORNBLÉNDE ROCK. II. THE WEATHERING OF HORNBLÉNDE, Macaulay Inst. for Soil Research, Aberdeen (Scotland).
For primary bibliographic entry see Field 02G.
W71-09636

Field 02—WATER CYCLE

Group 2J—Erosion and Sedimentation

THE FORMATION OF STABLE SOLS FROM LAPONITE, A SYNTHETIC HECTORITE-LIKE CLAY,
Laporte Industries Ltd., Redhill (England).
For primary bibliographic entry see Field 02G.
W71-09639

THE INTERACTION OF KAOLINITE WITH POLYPHOSPHATE AND POLYACRYLATE IN AQUEOUS SOLUTIONS - SOME PRELIMINARY RESULTS,
English Clays Lovering Pochin and Co., Ltd., St. Austell (England). Central Labs.
For primary bibliographic entry see Field 02K.
W71-09640

THE DIFFERENTIAL THERMAL ANALYSIS OF FLOCCULATED CLAY SAMPLES,
Salford Univ. (England).
D. Dollimore, G. R. Heal, and T. A. Horridge.
Clay Minerals, Vol 8, No 4, p 479-486, December 1970. 8 p, 4 fig, 2 tab, 3 ref.

Descriptors: *Kaolinite, *Flocculation, *Aqueous solutions, *Organic compounds, *Differential thermal analysis, Gels, Colloids, Suspension, Sedimentation, Analytical techniques, Mineralogy, Clays, Particle size.

Clays may be flocculated from suspension by various polymeric flocculating agents. In this study the technique of differential thermal analysis is used to identify the flocculating agent and to study its behavior when adsorbed on the clay particles. It is shown that the clay particles display normal properties on sedimenting in the presence of sufficient polymer to cause flocculation. The differential thermal analysis trace for clays is only affected when the flocculating agent is present on the surface in quantities in excess of that required for effective sedimentation. (Knapp-USGS)
W71-09641

JUSTIFICATION CHECK OF A METHOD FOR CALCULATING RESERVOIR-BANK TRANSFORMATION, AS WORKED OUT AT THE STATE HYDROLOGICAL INSTITUTE, AGAINST FIELD-OBSERVATION DATA (Russian: Proverka opravdyemosti metoda rascheta pereformirovaniya beregov vodokhranilishch, razrabotannogo v GGI, po materialam naturnykh nablyudeniy),
O. G. Grigor'yeva.
In: Hydraulic and Morphological Studies of Rivers and Water Bodies (Gidravliko-morfologicheskiye issledovaniya rek i vodoyemov), Gosudarstvennyy Ordena Trudovogo Krasnogo Znameni Gidrologicheskii Institut Trudy, No 169; Gidrometeorizdat, Leningrad, p 101-122, 1969. 22 p, 3 fig, 2 tab, 7 ref.

Descriptors: *Reservoirs, *Bank erosion, *Scour, *Deformation, *Forecasting, *Geomorphology, *Erosion, *Bank stability, *Probability, *Rocks, *Slopes, *Profiles, *Waves (Water).
Identifiers: *USSR, *European USSR, Gor'kiy Reservoir, Volgograd Reservoir, Tsimlyansk Reservoir.

The dimensions of three large reservoirs in the European USSR are given and the nature of their banks briefly described. Bank erosion forecasts are made for 8 calculated profiles of the reservoirs—one for the Tsimlyansk reservoir, three for the Volgograd reservoir and four for the Gor'kiy reservoir. A comparison of observed bank erosions with those calculated by a method worked out at the State Hydrological Institute (SHI) shows an average deviation of 31% of the most probable scour with fluctuations ranging from 11 to 43%, which approximates the accuracy possible in such morphological calculations. In 5 of 8 cases examined the bank line displacement either occurred within the limits of potential erosion in the probability range of 1 to 99% or exceeded them by 1 to 3 m. In two instances the actual bank line displacement exceeded the upper limit of 1% probability by

6 m and only in one case did it exceed the upper limit by 15 m. In all cases the period of bank erosion observations was far below the minimum forecast period of record of 12.5 years stipulated by the SHI method. (Josefson-USGS)
W71-09648

EROSION AND SEDIMENTATION FOLLOWING ROAD CONSTRUCTION AND TIMBER HARVEST ON UNSTABLE SOILS IN THREE SMALL WESTERN OREGON WATERSHEDS,
Forest Service, Portland, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 04C.
W71-09655

SOIL PIPING AND STREAM CHANNEL INITIATION,
Experimental Cartography Unit, London (England).
Anthony Jones.
Water Resources Research, Vol 7, No 3, p 602-610, June 1971. 9 p, 3 fig, 2 tab, 41 ref.

Descriptors: *Soil water movement, *Surface-groundwater relationships, *Bank erosion, *Soil erosion, *Sand boils, *Seepage, *Percolation, *Banks, *Permeability stream erosion, *Bank stability, *Channel erosion.
Identifiers: *Soil piping.

Soil piping has been associated primarily with drylands, yet evidence of piping is available from a large range of climatic regions; in particular, it is found to be widespread in the United Kingdom. Preferred locations for piping are either just above or within a horizon of low relative permeability and low aggregate stability. Chemical environment may range from acidic moorland soils to saline marshes. There are significant trends to lower aggregate stability and coarser grain size. Many pipes in the areas studied appear to be dormant or relatively inactive and may well be in approximate equilibrium with the soil pore and channel subsystems. However, when equilibrium is destroyed (for example, by stream incision) pipes can form loci for channel extension. Studies of the spatial distribution of outlets show that to create normal channel networks, pipe clusters within the ensemble and, similarly, individual pipes within those clusters must be selected on an unequal basis. A low density random selection from pipes located on soil water flowlines would fulfill the requirements. The presence of piping may have a significant effect on the form of the hydrograph. (Knapp-USGS)
W71-09827

DATA ON THE GRANULOMETRY OF THE SURFICIAL SEDIMENT LAYER OF THE RAZELM-SINOE LAGOONAL COMPLEX (French: Donnees sur la granulometrie de la couche superficielle de sediments du complexe lagunaire Razelm-Sinoe),
Institute of Hydrotechnical Research, Bucharest (Rumania).
I. State, and I. Decu.
In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 158-164, 1970. 7 p, 2 fig, 1 tab, 4 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Sampling, *Deltas, *Lakes, *Sedimentation, *Sediment load, *Aggradation, *Siltation, *Sedimentary structures, *Stratigraphy, *Alluvium, *Alluvial channels.
Identifiers: *Danube delta.

The lagoon complex Razelm-Sinoe by its origin and evolution is considered to belong to the Danube Delta, which is subject to intensive aggradation. Data were collected for a better understanding of the granulometry distribution of the deposits on the bottom of the main lake-basins of the complex (Razelm, Golovita, Sinoe). Deposits on the bottom of these lakes have both a mineral and biological

origin. The main part is conveyed from the Danube river through the connecting channels and canals Dranov, Mustaca, Dunaval, and Fundea. The Dranov and Dunaval canals carry yearly into Razelm lake approximately 192,006 cu m of suspended load. Data obtained were used to draw up five cross profiles showing the percentage distribution of characteristic diameters and a map showing the plane distribution of the median diameter. (Knapp-USGS)
W71-09829

CHARACTERISTICS OF THE WATER FLOW INSIDE THE DANUBE DELTA,
Institute of Hydrotechnical Research, Bucharest (Rumania).
Constantin Diaconu, and Viorel Al. Stanescu.
In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 220-238, 1970. 19 p, 10 fig, 1 tab. (Also published in IASH Publication No 90, 1970).

Descriptors: *Deltas, *Streamflow, *Water storage, *Runoff, *Topography, *Geomorphology, *Lakes, *Water levels, *Water level fluctuations, *Stage-discharge relations.
Identifiers: *Danube delta.

The hydrologic regime of the Danube Delta has some characteristics which have led to an original hydrogeologic method of investigation. Because of their close inter-relation, the morphological aspects have to be considered as parts of the same organic whole. Morphohydrographic elements can be divided into two distinct categories: (1) positive elements (soils of predeltaic origin, river and maritime ridges) and (2) negative elements (the hydrographical network and the depressions inside the delta). The depressions inside the delta play an important part as an accumulation basin in the water circulation system between the arms and the interior of the delta. The principal water courses are: the main arms, the connecting channels between the arms and the inside of the delta, the connecting channels between the arms and the outside of the delta, and the connecting channels between the inside zones and the sea. These discharges on their way to the sea are modified by water storage inside the delta, by the rate of increase of the water levels and by the duration of high waters. This result was plotted as a diagram showing the differences between the discharges at the branching point and at the mouth of the arms, and the discharges at the apex of the delta. (Knapp-USGS)
W71-09830

TRANSFORMATION OF RIVER WATERS TO SEA WATERS AT RIVER MOUTHS,
State Oceanographic Inst., Moscow (USSR).
For primary bibliographic entry see Field 02K.
W71-09831

REMARKS ON THE REGIONAL GEOLOGICAL STRUCTURE OF THE NILE DELTA,
Egyptian Desert Inst., Cairo.
A. Shata, and I. El Fayoumy.
In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 189-197, 1970. 9 p, 13 fig, 9 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Structural geology, *Geologic control, *Geology, *Deltas, *Faults (Geology), *Subsidence, *Sedimentation, *Geomorphology, *Hydrogeology, *Structure.
Identifiers: *Nile Delta.

The regional geological structure of the Nile Delta is a portion of a major downwarp zone characterizing the unstable shelf region of Northern UAR. This downwarp zone is affected by faulting, particularly in the southern portion. Within that portion two sets of faults are suspected; the NW set of

faults which account for the local development of a graben-like structure and the NE set of faults. Towards the northern edge of this downwarp zone, thrust faulting with a NE strike is expected. (Knapp-USGS)
W71-09832

THE NATURAL EQUILIBRIUM OF DELTAS (French: L'équilibre naturel des deltas), Academia R.P.R., Bucharest. Hydrologic Commission.

A. C. Banu.
In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 184-188, 1970. 5 p, 7 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Deltas, *Sedimentation, *Water chemistry, Equilibrium, Climates, Geology, Geomorphology, Hydrogeology, Reviews, Environment, Alluvial channels, Channel morphology.
Identifiers: Delta growth.

The natural equilibrium of deltas is extremely unstable. It involves quantitative and qualitative relationship of stable proportion between climatic, geological and geomorphological, hydrological, chemical and biological processes. This equilibrium is maintained as long as the dynamic processes occurring in the deltaic environment are not modified as to their direction, intensity and frequency. The importance of the causal influence among these factors increases from the physico-chemical processes towards the biological ones. In its turn, the biologic factor influences the physico-chemical factors; however, the importance of this influence and of its effect on the content of the biotope varies with the evolution of the delta. A marked and rapid reversal of equilibrium takes place when man's intervention in the exploitation of deltas is made in opposition to the normal processes of evolution. (Knapp-USGS)
W71-09833

MORPHOLOGICAL AND HYDROLOGICAL CHARACTERISTICS OF LAKES OF THE DANUBE DELTA (French: Les caractéristiques morphologiques et hydrologiques des lacs du delta du Danube), Institutul Geologic, Bucharest (Romania). Petre Gastescu.

In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 172-181, 1970. 10 p, 3 fig, 1 tab, 5 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Deltas, *Geomorphology, *Water balance, *Lakes, Sedimentation, Hydrology, Reviews, Hydrogeology, Surveys, Streamflow, Sediment load.
Identifiers: *Danube delta.

A short general description is given of the Danube delta as a morphological and physiographical unit. The Danube delta may be divided in two parts: fluviolacustrine, and lagoonal (marine). The morphobathymetrical characteristics and the hydrographical relations of the lakes with the main arms of the Danube are related to major features in the hydrologic regime, especially the hydrologic budget. The values of the water balance terms reflect the geographical zonality of precipitation and evaporation and the azonality of runoff. (Knapp-USGS)
W71-09834

HYDROLOGICAL PROCESSES IN OFFINGS AND THEIR ROLE IN FORMATION OF A DELTA FRONT, State Oceanographic Inst., Moscow (USSR). N. A. Skriptunov.

In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: Interna-

tional Association of Scientific Hydrology-Unesco Co-edition, p 164-172, 1970. 9 p, 6 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Deltas, *Sedimentation, *Geomorphology, Waves (Water), Hydrology, Sedimentary structures, Deposition (Sediments), Bed load, Suspended load, Stratigraphy, Tides, Topography, Sands.

The boundaries of the seaward parts of river mouths, zonation, classification, the factors determining type and the main factors determining the regime are considered together with river-mouth hydrological processes (water level, currents, turbidity, salinity, ice conditions, waves, etc.). The influences of hydrological conditions on the hydrological and morphological characteristics of delta branches are discussed. Changes in hydrological conditions under the influence of man-made structures are also considered. The delta front, as a result of interaction between river and sea, is the most dynamic type of shore. The factors determining the formation of the type of delta front are given, in particular for development of delta fronts with prevalence of sea factors or with prevalence of river factors. The seasonal prevalences of river and sea factors, is the reason of the cyclic evolution of delta fronts. The role of man's activity in changing of delta fronts and delta bars is considered and the possibility of the forecasting of the type of delta front with an artificial mouth is discussed. (Knapp-USGS)
W71-09835

HYDROLOGIC-MORPHOMETRIC CHARACTERISTICS OF DELTA BRANCHES, State Oceanographic Inst., Moscow (USSR). V. N. Mikhailov.

In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 146-158, 1970. 13 p, 5 fig, 3 tab, 6 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Deltas, *Sedimentation, *Sediment transport, *Sedimentary structures, Hydraulics, Geomorphology, Channel morphology, Bed load, Sediment load, Equations.

The main hydrologic-morphometrical characteristics of delta branches are: water discharge; water level; mean elevation of bottom; water surface slope; mean flow velocity; cross-section area; channel width; mean depth; sediment discharge; mean sediment concentration; mean diameter of bottom sediments; Manning's coefficient of roughness. All hydrologic-morphometric characteristics of branches change both in time and in space. The main factors determining their variability are hydrological conditions at upper and lower boundaries of deltas (water discharge and sea level), channel processes in branches (erosion and accretion of bed), specific river mouth processes, interaction between sea and river waters, development of deltas, and local hydraulic conditions. Methods are given for estimation of hydrologic-morphometric characteristics of delta branches by hydrometric, hydraulic and hydrologic-morphometric equations. (Knapp-USGS)
W71-09836

HYDRAULIC THEORY FOR THE BOTTOM STREAM MOVEMENT OF THE RIVER BED SEDIMENT ON THE LANDWARD SIDE OF THE SHELF EDGE IN ESTUARIES, Zakavkazskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Tiflis (USSR). T. G. Vojnich-Spanojensky, L. D. Gogel'any, and B. I. Kalandadze.

In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 128-137, 1970. 10 p, 8 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Deltas, *Sediment transport, *Bed load, *Suspended load, *Turbidity currents, Turbulent flow, Waves (Water), Mud, Sedimentation, Dispersion, Mixing, Scour, Erosion.
Identifiers: Boussinesq equation.

A one-dimensional theory of movement is given for river flow with high sediment concentration over a river-bank and great drop in depth at the bottom of submerged canyons near the river mouth. One-dimensional hydraulic equations are deduced from the general dynamic equations for turbulent flow of liquids containing suspended solids. They are derived from equations of Saint-Venant-Boussinesq. An approximation of the friction mechanism is obtained by combining semi-empirical theories, taking in account the influence of the solids component on the intensity of turbulence and additional account of Coulomb friction on the dispersoid contact with the surface of the shelf edge. Using equations of dynamics and mass balance, the conditions of wave movement for the basal stream of a flow with high concentrations of sediment on a steep shelf edge are analyzed and modifications are derived for calculating velocities of dense streams with muddy characteristics on the bottoms of submerged canyons near the estuary. (Knapp-USGS)
W71-09837

FORMATION OF MODERN DELTA BRANCHES ON NON-TIDAL RIVERS WITH LARGE SEDIMENT DISCHARGE, State Oceanographic Inst., Moscow (USSR). S. S. Baydin.

In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 113-120, 1970. 8 p, 5 fig, 7 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Deltas, *Sedimentation, *Sediment load, Bed load, Deposition (Sediments), Geomorphology, Sediment discharge, Alluvial channels.

Formation of the distributary networks of non-tidal deltas with large sediment discharge is connected with breaking of natural levee. The complete cycle includes four stages: the lacustrine stage, the many-branched stage (within the delta), the single-branched stage, and the many-branched stage (seaward of the delta front). The duration of each stage depends on the amount of sediment transport, on the possibility of sedimentation in a flood plain or on the possibility of sedimentation at the place where the river flows into the sea. The variability of channel processes, the profile of the water surface and the water discharge distribution between the branches, the influence of man-made levees, and of base level change on the processes and the duration of the cycle and its stages are discussed. (Knapp-USGS)
W71-09838

SOME PROBLEMS OF MOVEMENT OF SOLID MATERIALS AND OF EROSION IN ESTUARIES AND DELTAS (French: Quelques problèmes du mouvement des matériaux solides et de l'érosion dans les estuaires et les deltas), Ghent Rijksuniversiteit (Belgium). L. J. Tison, and G. Tison.

In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 101-112, 1970. 12 p, 9 fig, 6 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Sedimentation, *Tidal effects, *Estuaries, *Deltas, *Channel improvement, Currents (Water), Velocity, Silting, Bed load, Scour, Erosion, Waves (Water).
Identifiers: Channel changes.

Improvement of the lower part of a river can be the cause of important changes in the morphology of the estuary or the delta by facilitating of tidal

Field 02—WATER CYCLE

Group 2J—Erosion and Sedimentation

waves. This easier penetration causes both an increase in the flood volume and a reduction in time of the flood. The resulting growth in the velocity of the flood is not accompanied by a corresponding increase in the rapidity of the ebb, with the consequence that the solid materials have a marked tendency to be returned towards the upstream part of the delta region, where sedimentation increases. Local changes, even though in themselves insignificant, considerably change sharing of the flows between various arms, causing marked changes in the movement of materials, which could even lead to choking some arms. (Knapp-USGS) W71-09839

ANCIENT DELTAS ON ROMANIAN TERRITORY (French: *Deltas anciens sur le territoire de la Roumanie*), Pedagogical Inst., Suceava (Romania); and Research Inst. for Land Reclamation and Soil, Bucharest (Romania). N. Popp, and D. Teaci.

In: *Hydrology of Deltas*, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 89-100, 1970. 12 p, 2 fig, 7 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Deltas, *Sedimentation, *Paleohydrology, Sedimentary structures, Lakes, Soil formation, Stratigraphy, Geomorphology, Climates.
Identifiers: *Romania.

In the extra-carpathian plains, especially in the Western Plain of Romania, are scattered a series of old deltaic plains, developed after the general drainage of the Panonic lake and of other lakes. The history of these deltas under different geomorphological, hydrogeological and climatic conditions, can be used to study evolution of the Danube Delta. For each of the old deltas (Somes, Crisuri, Mures, Timis-Bega, Dimbovitza, Prahova, Siret) the present situation is characterized to explain chronologically their evolution and all the effects this evolution had on the development of the landscape as a whole, and on soil formation. (Knapp-USGS) W71-09840

GEOPHYSICAL CONTRIBUTIONS TO THE STUDY OF THE GEOLOGIC EVOLUTION AND MORPHOGENESIS OF THE DANUBE DELTA (French: *Contributions geophysiques a la connaissance de l'evolution geologique et de la morphogenese du Delta du Danube*), Institutul de Geozica Aplicata, Bucharest (Romania); and State Commission for Geology, Bucharest (Romania).

Stefan Airinei, and Artemiu Pricajan.
In: *Hydrology of Deltas*, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 64-74, 1970. 11 p, 3 fig, 18 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Sedimentation, *Deltas, *Stratigraphy, *Topography, *Sedimentary structures, Geology, Geophysics, Geomorphology, Geologic control, Subsidence.
Identifiers: *Danube delta.

A correlation of the geophysical and geological data in the Danube delta shows (a) the structure of the deep basement, which is dislocated in steps, horsts, and grabens; (b) the structure of the immediate predeltaic basement; (c) the structural and erosional immediate basement invaded by the first paleo-euxinic transgression; (d) the trends of redistribution and sedimentation of the deltaic material. The W-E orientation is predominant in the structures of the deep basement, and in structures subordinate to the immediate basement, as well as in predeltaic morphological forms of the peninsular and insular system. The microrelief of the Delta inner ridges and littoral belts are approximately NE-SW. They were formed by redistribution and

sedimentation of deltaic material under preponderant influences of maritime and eolian currents. (Knapp-USGS) W71-09841

DELTA OF THE ZONES CHARACTERIZED BY SINKING OF THE EARTH'S CRUST, Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.

V. V. Egorov.

In: *Hydrology of Deltas*, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 38-43, 1970. 6 p, 4 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Deltas, *Sedimentation, *Subsidence, Deposition (Sediments), Stratigraphy, Geomorphology, Alluvium, Alluvial channels, Coasts, Estuaries, Sea level, Bed load, Sediments.
Identifiers: *USSR.

The formation of deltas under conditions of crustal of sinking on the coasts of tideless water bodies is discussed. The Aralo-Caspian and Black Sea Coast deltas of the Kura, Terek, Kuban and Prut rivers as well as the paleodelta of the Volga can serve as an example of this type of delta. If the rate of sinking exceeds that of alluvium accumulation which is accompanied by delta withdrawal and intrusion of sea waters into a river valley, an estuary is formed. Under a slower process of delta sinking, the rate of alluvium accumulation exceeds that of sinking and a delta is formed. The formation of series of deposits and relief forms, the state of groundwater and the processes of modern salt accumulation in the deltaic regions are considered in relation to these two situations. (Knapp-USGS) W71-09842

HYDROLOGY OF DELTA DEPOSITS IN GLACIATED VALLEYS IN NEW YORK, Geological Survey, Orlando, Fla. Water Resources Div.

Leslie J. Crain.

In: *Hydrology of Deltas*, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 29-37, 1970. 9 p, 9 fig, 5 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Deltas, *Aquifers, *Glacial drift, *New York, Sands, Clays, Lakes, Aquifer characteristics, Water storage, Water yield, Pleistocene epoch, Stratigraphy, Water resources development.
Identifiers: Jamestown (NY), Finger Lakes (NY).

Glaciated valleys in southwestern New York State contain thin layers of glaciofluvial sand and gravel interbedded in thick sequences of lacustrine material. These sand and gravel layers are important aquifers. The valleys also contain buried deltaic deposits adjacent to the valley walls. Streams that drained the uplands formed deltas in the pro- and post-glacial lakes in the valleys. Most of the delta deposits are in hydraulic contact with the glacial aquifers at depth; the deltas provide areas for recharge and reservoirs for storage of water. Wells that tap the glacial aquifers drain the stored water during summer and the water is replenished by precipitation and stream infiltration during winter and spring. Because of the relation of the delta deposits to the glacial aquifers the deltas have great potential for increasing groundwater yields through the manipulation of their water levels by pumping the glacial aquifers and by acting as temporary reservoirs to store excess streamflow during floods. Results of these studies apply to other regions in the western part of the state as they may to many other glaciated areas. (Knapp-USGS) W71-09843

2K. Chemical Processes

A LABORATORY STUDY OF THE SOLUBLE METALS IN ROCK FROM THE BROAD QUADRANGLE, GEORGIA, Georgia Inst. of Tech., Atlanta: Water Resources Center.

Charles A. Salotti.

Available from the National Technical Information Service as PB-200 656, \$3.00 in paper copy, \$0.95 in microfiche. Water Resources Center, Georgia Institute of Technology, Atlanta, June 1971, 11 p. OWRR Project A-021-GA (1).

Descriptors: *Soluble metals, *Granites, *Aqueous solutions, *Absorption, Magnesium, Calcium, Groundwater, Solubility, Georgia, *Solubility, Solutes, Analytical techniques, Spectrophotometry.

Identifiers: *Broad Quadrangle (Georgia), *Saprolite, Danburg granite.

The purpose of the study was to determine the solubilities of specific metals under controlled conditions from mineralogically and chemically studied rocks from the Broad Quadrangle, Georgia. Distilled deionized water was circulated in a non-contaminating system through crushed granite at controlled rates and temperature for a period of several months. The solubilities of calcium and magnesium were measured in the laboratory and compared with concentrations measured in the field. These comparisons showed that the natural concentrations of calcium and magnesium are much higher than those measured in the laboratory. The absence of dissolved carbon dioxide in the laboratory water was thought to account partly for the low experimental concentrations, but not the large difference found. Colloidal and/or organo-metallic transport possible accounts for part of the discrepancy. (Conway-Georgia Tech) W71-09466

PRECIPITATION OF PHOSPHATES FROM WATER WITH FERROUS SALTS, Ohio State Univ., Columbus. Dept. of Chemical Engineering.

For primary bibliographic entry see Field 05D.
W71-09555

NEW WATER DISINFECTANT: AN INSOLUBLE QUATERNARY AMMONIUM RESIN-TRIIODIDE COMBINATION THAT RELEASES BACTERICIDE ON DEMAND, Kansas State Univ., Manhattan. Dept. of Chemistry; and Kansas State Univ., Manhattan. Div. of Microbiology.

For primary bibliographic entry see Field 05F.
W71-09562

EVALUATION OF THE MADISON LIMESTONE IN THE WILLISTON BASIN FROM WELL LOGS AND CORES, Bureau of Mines, Laramie, Wyo., Energy Research Center.

For primary bibliographic entry see Field 02F.
W71-09595

THE SOLUBILITY OF CO₂ IN WATER AND SEA WATER,

Harvard Univ., Cambridge, Mass. Hoffman Lab.

Yuan-Hui Li, and Tien-Fung Tsui.
Journal of Geophysical Research, Vol 76, No 18, p 4203-4207, Jun 20, 1971. 5 p, 5 fig, 3 tab, 13 ref.

Descriptors: *Solubility, *Carbon dioxide, *Sea water, Salinity, Water temperature, Water chemistry, Chemical reactions, Aqueous solutions, Equilibrium.

The solubility of CO₂ in acidified sea water, NaCl solution, and distilled water have been redetermined in the laboratory using an infrared gas analyzer technique. The observed solubility con-

stants of CO₂, in samples at different temperatures are tabulated. Each data point represents the average of two determinations. The reproducibility of data is within 0.5% or better. The most striking result is that alpha in 0.6413 M NaCl solution and in 20 Cl parts per thousand sea water are identical within experimental uncertainty (0.5%). This means that Bush's assumption is correct. (Knapp-USGS)
W71-09605

INTERSTITIAL DIFFUSION AND ADVECTION OF SOLUTE IN ACCUMULATING SEDIMENTS., Weizmann Inst. of Science, Rehvoth (Israel). Isotope Dept.
For primary bibliographic entry see Field 02J.
W71-09606

DOES UPWARD DIFFUSION SUPPLY THE EXCESS MANGANESE IN PELAGIC SEDIMENTS, Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 02J.
W71-09607

A STATISTICAL METHOD FOR ANALYSIS OF DIFFUSION IN SOILS, Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 02G.
W71-09615

EFFECT OF Mg (2.) ION ON THE SOLUBILITY OF SOLID CARBONATES, Utah State Univ., Logan. Dept. of Soils and Meteorology.
J. J. Hassett, and J. J. Jurinak.
Soil Science Society of America Proceedings, Vol 35, No 3, p 403-406, May-Jun 1971. 4 p, 5 fig, 1 tab, 15 ref.

Descriptors: *Carbonates, *Magnesium, *Dolomite, *Irrigation water, *Solubility, Aqueous solutions, Solutes, Leaching, Mineralogy, Chemical precipitation, Calcite, Water chemistry, Water quality, Salinity, Chemical potential.
Identifiers: Common ion effect, Sodium hazard.

The carbonate satumeter was used to determine the effect of Mg ion on the solubility of four different calcareous materials. It was found that a high area calcite (about 13.5 sq m/g) had a higher solubility than a low area calcite (about .8 sq m/g) and that the difference in surface areas of these calcites modified the effect of Mg ion on their solubilities. The mineralogy of the solid carbonates can modify the effect of Mg ion on the solubility of the solid phase. Carbonates which contained appreciable Mg showed a decrease in solubility with increasing Mg ion, whereas carbonates with low or no Mg showed an increase in solubility. (Knapp-USGS)
W71-09616

ISOTOPICALLY EXCHANGEABLE COBALT: THE EFFECT OF SOIL pH AND IONIC SATURATION OF THE SOIL, Missouri Univ., Columbia. Dept. of Agronomy.
G. L. Gille, and E. R. Graham.
Soil Science Society of America Proceedings, Vol 35, No 3, p 414-416, May-Jun 1971. 3 p, 1 fig, 4 tab, 12 ref.

Descriptors: *Soil chemistry, *Cobalt, *Aqueous solutions, Sudangrass, Tracers, Ion exchange, Adsorption, Clay minerals, Chemical potential.

Large increases in the uptake of Co, Zn, and Mn by sudangrass were observed when FeCl₂, AlCl₃, and CaCl₂ were added to the soil in which the plants were grown. The isotopically exchangeable cobalt in the soil remained unchanged regardless of the soil pH or the addition of Fe, Al or Ca to the soil. Increases in the cobalt content of sudangrass result

from changes in the soil solution concentration of cobalt in the soil rather than the quantity of cobalt. The effect of Fe, Al, and Ca additions and soil pH in producing the changes in cobalt content of sudangrass was caused by soil factors rather than changes in plant response. One-hundredth normal HCl is a useful extracting agent for determining the quantity of cobalt in the soil, and 0.1M CaCl₂ gives the best indication of the potential soil solution concentration of cobalt in the soil. (Knapp-USGS)
W71-09617

CALCULATION OF THE LEACHING REQUIRED TO REDUCE THE SALINITY OF A PARTICULAR SOIL DEPTH BENEATH A SPECIFIED VALUE, California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 02G.
W71-09618

INTRODUCTION TO SYMPOSIUM--THE SOIL SOLUTION, Agricultural Research Service, Auburn, Ala. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02G.
W71-09619

IONIC CONCENTRATIONS AND ACTIVITIES IN THE SOIL SOLUTIONS, Auburn Univ., Ala. Dept. of Agronomy and Soils.
For primary bibliographic entry see Field 02G.
W71-09620

SOLUTION OF ION ACTIVITY AND PLANT GROWTH, Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Agricultural Development.
For primary bibliographic entry see Field 02G.
W71-09621

COMPUTATION OF SOIL SOLUTION COMPOSITION VARIATION WITH WATER CONTENT FOR DESATURATED SOILS, Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 02G.
W71-09622

PROBLEMS ASSOCIATED WITH THE DETERMINATION AND APPLICATION OF THE SOLUBILITY PRODUCT CONSTANT, Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 02G.
W71-09623

A STUDY OF WEATHERING IN A SOIL DERIVED FROM A BIOTITE-HORNBLÉNDE ROCK. I. WEATHERING OF BIOTITE, Macaulay Inst. for Soil Research, Aberdeen (Scotland).
For primary bibliographic entry see Field 02G.
W71-09635

THE ADSORPTION OF POLY (ETHYLENE GLYCOLS) ON CLAY MINERALS, Adelaide Univ. (Australia). Waite Agricultural Research Inst; and Adelaide Univ. (Australia). Dept. of Agricultural Biochemistry and Soil Science.
For primary bibliographic entry see Field 02G.
W71-09637

ADSORPTION OF WATER BY MONTMORILLONITE - POLY (ETHYLENE GLYCOL) ADSORPTION PRODUCTS, Adelaide Univ. (Australia). Waite Agricultural Research Inst., and Adelaide Univ. (Australia). Dept. of Agricultural Biochemistry and Soil Science.

For primary bibliographic entry see Field 02G.
W71-09638

THE INTERACTION OF KAOLINITE WITH POLYPHOSPHATE AND POLYACRYLATE IN AQUEOUS SOLUTIONS - SOME PRELIMINARY RESULTS, English Clays Lovering Pochin and Co., Ltd., St. Austell (England). Central Labs.
J. I. Bidwell, W. B. Jepson, and G. L. Toms.
Clay Minerals, Vol 8, No 4, p 445-459, December 1970. 15 p, 5 fig, 4 tab, 37 ref.

Descriptors: *Adsorption, *Kaolinite, *Phosphates, *Clay minerals, *Rheology, Flocculation, Electrolytes, Gels, Colloids, Clays, Viscosity.

The choice of kaolinite sample for surface chemical studies is examined. An adsorption apparatus, particularly suited for those studies where the adsorbate acts as a deflocculant, is described. Some preliminary results are given for the adsorption of total phosphate from tetrasodium pyrophosphate solutions and of polyacrylate from sodium polyacrylate solutions. The release of aluminum and silicon from the kaolinite was measured; with tetrasodium pyrophosphate, aluminum-phosphate complexes are formed. Competitive adsorption measurements suggest that the polyacrylate is adsorbed on the positively charged edges of the kaolinite. (Knapp-USGS)
W71-09640

DISTRIBUTION AND FORMS OF MERCURY IN GROUND-AND SURFACE WATERS IN A REGION OF MOLYBDENUM DEPOSITS (Russian: O rasprostranennosti i formakh nakhozhdeniya rtuti v gruntovykh i poverkhnostnykh vodakh v rayone molibdenovykh mestorozhdeniy), Akademiya Nauk SSSR, Novosibirsk. Institut Geologii i Geofiziki.
For primary bibliographic entry see Field 05B.
W71-09644

BIOGEOCHEMICAL DISPERSION HALOS OF TIN IN A MONSOON CLIMATE OF THE SOUTHERN PART OF THE SOVIET FAR EAST (Russian: Biogeokhimicheskiye oreoly rasseyaniya olova v usloviyakh mussonnogo klimata yuga Dal'nego Vostoka), Khabarovskii Kompleksnyi Nauchno-Issledovatel'skii Institut (USSR).
For primary bibliographic entry see Field 05B.
W71-09645

EXTRACTION OF ANIONS AND CATIONS FROM RECENT VOLCANIC ASH, Inter-American Inst of Agricultural Sciences, Turrialba (Costa Rica). Research and Training Center.
For primary bibliographic entry see Field 02G.
W71-09807

EFFECT OF ADDED SALT ON NITROGEN MINERALIZATION IN THREE CALIFORNIA SOILS, California Univ., Davis. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 02G.
W71-09809

THE ROLE OF SPARINGLY SOLUBLE SOLIDS AND CATION EXCHANGE REACTIONS IN CONTROLLING CONDITIONS IN SOIL SOLUTIONS, Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
For primary bibliographic entry see Field 02G.
W71-09810

TRANSFORMATION OF RIVER WATERS TO SEA WATERS AT RIVER MOUTHS, State Oceanographic Inst., Moscow (USSR). A. I. Simonov.

Field 02—WATER CYCLE

Group 2K—Chemical Processes

In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 182-184, 1970. 3 p. (Also published in IASH Publication No 90, 1970).

Descriptors: *Water chemistry, *Mixing, *Deltas, Salinity, Turbidity, Sedimentation, Chemical precipitation, Water temperature, Reviews, Discharge (Water), Water circulation, Currents (Water), Density, Waves (Water), Estuaries.

The results of dynamic and chemical interaction between river and sea waters at the mouth (energy, suspended solids content, heat discharge, slight mineralization and salt balance) are discussed. River discharge is the leading factor of water mixing. Chemical exchange accompanies dynamic mixing. The laws of change of flow velocity, salinity, turbidity and water temperature during mixing are determined; the general equation of mixing includes a linear component to reflect dynamic mixing conditions and a non-linear component to reflect chemical transformations. The transformation of salt composition typical of river water to that typical of sea water is independent of the salinity of sea water. These laws facilitate investigation and explanation of the hydrological and hydrochemical processes taking place at river mouths. They can also be applied to studies of the dynamics of substances relevant to pollution. (Knapp-USGS)

W71-09831

2L. Estuaries

A WATER RESOURCE-WATER SUPPLY STUDY OF THE POTOMAC ESTUARY, Environmental Protection Agency, Annapolis, Md. Chesapeake Technical Support Lab.

For primary bibliographic entry see Field 05B. W71-09788

A COMPREHENSIVE STUDY OF SAN FRANCISCO BAY, California. University of Berkeley. Sanitary Engineering Research Lab.

For primary bibliographic entry see Field 05A. W71-09790

UTILITY OF RADIOISOTOPE METHODOLOGY IN ESTUARY POLLUTION CONTROL STUDIES. PART I. EVALUATION OF THE USE OF RADIOISOTOPES AND FLUORESCENT DYES FOR DETERMINING LONGITUDINAL DISPERSION COEFFICIENT IN ESTUARIES.

Quirk, Lawler and Matusky Engineers, New York. For primary bibliographic entry see Field 05B. W71-09791

ESCAROSA: A PRELIMINARY STUDY OF COASTAL ZONE MANAGEMENT PROBLEMS AND OPPORTUNITIES IN ESCAMBIA AND SANTA ROSA COUNTIES, FLORIDA. Florida Coastal Coordinating Council, Tallahassee.

Florida Coastal Coordinating Council Report, Tallahassee April 1971, 29 p, 7 fig, 3 tab, 98 ref.

Descriptors: *Florida, *Coasts, *Zoning, *Estuaries, *Environmental effects, Soils, Human population, Economics, Land use, Waste disposal, Erosion, Water quality, Dredging, Landfills, Agriculture. Identifiers: *Escambia County, *Santa Rosa County.

The Coastal Coordinating Council was charged by the 1970 Florida Legislature to develop a plan for the protection, development and zoning of the coasts of Florida. Escarosa (Escambia and Santa Rosa Counties) was selected as a preliminary project as an overview of the principal problems of Coastal Zone management. These problems are typical of most populated coastal areas of Florida.

The Northwest Florida Regional Coastal Management Plan will be the first in a series of regional plans which will be developed for the entire Florida Coast. Natural environmental characteristics, socio-economic characteristics, environmental problems and management practices are discussed. (Ensign-PAI)

W71-09794

STUDIES OF ESTUARINE DEPENDENCE OF ATLANTIC COASTAL FISHES, National Marine Fisheries Service, Highlands, N.J. Sandy Hook Marine Lab.

For primary bibliographic entry see Field 05C. W71-09800

HYDRAULIC THEORY FOR THE BOTTOM STREAM MOVEMENT OF THE RIVER BED SEDIMENT ON THE LANDWARD SIDE OF THE SHELF EDGE IN ESTUARIES,

Zakavkazskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Tiflis (USSR).

For primary bibliographic entry see Field 02J. W71-09837

SOME PROBLEMS OF MOVEMENT OF SOLID MATERIALS AND OF EROSION IN ESTUARIES AND DELTAS (French: Quelques problèmes du mouvement des matériaux solides et de l'érosion dans les estuaires et les deltas), Ghent Rijksuniversiteit (Belgium).

For primary bibliographic entry see Field 02J. W71-09839

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

A BASIC STUDY OF FERROUS MATERIALS FOR DESALINATION EQUIPMENT, Case Western Reserve Univ., Cleveland, Ohio.

For primary bibliographic entry see Field 08G. W71-09746

3B. Water Yield Improvement

EVAPOTRANSPIRATION AND ITS CHEMICAL REDUCTION,

Kansas State Univ., Manhattan. Water Resources Research Inst.

For primary bibliographic entry see Field 02D. W71-09556

A COMPREHENSIVE REPORT ON NINETEEN CONDENSATION NUCLEI. PART II, Atmospheric Sciences Lab, White Sands Missile Range, N.Mex.

Richard D. H. Low.

Available from the National Technical Information Service as AD-721 591, \$3.00 in paper copy, \$0.95 in microfiche. U.S. Army ECOM Report 5358, Jan 1971. 260 p.

Descriptors: *Artificial precipitation, *Nucleation, *Cloud seeding, *Weather modification, Clouds, Nitrates, Iodides, Sulfates, Fog, Condensation. Identifiers: Chlorides, Bromides, *Condensation nuclei, Hygroscopicity, Cloud physics.

This is Part II of 'A Comprehensive Report on Nineteen Condensation Nuclei,' which contains tabulations of the growth times of these nuclei under various assumed supersaturations. The growth time of each nucleus at a given supersaturation is obtained from a newly developed growth rate equation which utilizes a single parameter to denote the hygroscopicity of the nucleus and which includes an additional term to reflect the inefficient

cy of the condensation process. This volume and its predecessor serve as a valuable reference for the experimental cloud physicist in his study of the growth behaviors of condensation nuclei and for the field cloud physicist in his selection of the proper artificial nuclei for warm fog or cloud modification. W71-09576

PREDICTING WELL YIELDS - TWO CASE HISTORIES, Patchick Consulting Hydrogeologist, White Bear Lake, Minn.

P. F. Patchick.

Groundwater Vol 5, No 2, p 41-53, April 1967, 6 tab, 6 fig, 3 photo, 26 ref.

Descriptors: *Water wells, *Groundwater, Aquifer characteristics, Logging (Recording), Specific capacity, Screens.

Identifiers: *Permeability estimates (Wells), Drill cutting.

Two case histories are presented which illustrate that by analyzing drill cuttings or bailed samples, by knowing total depth of a test hole and position of the static water level, and by studying the driller's log, not only can a well's yield be predicted - but also drawdown may be predicted for any well in advance of a pumping test. The estimation of specific capacity (gpm/ft of drawdown) is invaluable in well design, particularly in the United States, where drilling contractors work rapidly and efficiently. Knowledge of probable specific capacity can aid in recommending proper screen length, diameter, slot width, and setting. It will enable cost estimates for proper pump size to be made, for casing requirements to be determined, and also for ultimate well diameter and depth to be determined. Test-pump setting can also be anticipated. Six figures are included showing well construction details, sieve analysis curves, a semi-log plot of recovery measurements obtained during an aquifer pumping test, and graphic representations of approximate permeabilities for granular materials ranging from clay/silt to fine gravel. Six tables give characteristics of samples recovered from two test wells, permeability estimates of the disturbed samples, approximate permeabilities of various granular materials, and specific capacities for 100 percent effective water wells with varying diameters, coefficients of storage, and pumping periods. Three photographs further illustrate the principles enumerated. The methods described can give acceptable results (although they may not be as spectacular as the two detailed case histories) if sound judgment is used; if local conditions are somewhat known; if sampling methods are described; and if the procedures are not abused by expecting extreme accuracy. A reasonable estimate, or perhaps, 'guesstimate' is all that should be hoped for by the hydrogeologist. (Campbell-NWWA)

W71-09733

A GENERALIZED PROBABILISTIC APPROACH TO REGIONAL WATER SUPPLY ASSESSMENT,

Environmental Dynamics, Inc., Los Angeles, Calif.

For primary bibliographic entry see Field 06A. W71-09735

3C. Use of Water of Impaired Quality

FEASIBILITY STUDY FOR GLENDALE - LOS ANGELES WATER RECLAMATION PLANT.

Engineering Science, Inc., Los Angeles, Calif; and Koebig and Koebig, Inc., Los Angeles, Calif.

For primary bibliographic entry see Field 05D. W71-09590

SUPPLEMENTAL IRRIGATION WITH STREAM WATER CONTAMINATED BY ACID MINE DRAINAGE, Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center. Richard W. Terkelstou. Water Resources Research, Vol 7, No 3, p 704-708, June 1971. 5 p, 2 fig, 1 tab, 3 ref.

Descriptors: *Acid mine water, *Irrigation water, *Pennsylvania, Water pollution control, Iron, Hydrogen ion concentration, Water utilization, Flooding, Water chemistry, Soil-water-plant relationships, Water quality, Sampling, Impaired water quality.

Many streams in the Appalachian coal producing region, which could furnish supplemental irrigation water, are polluted with acid mine drainage. They consequently contain much greater trace concentrations and have lower pH than do nearby streams that carry only agricultural drainage. Nevertheless, supplemental irrigation of barley plants grown in a greenhouse with acid mine water was as beneficial to plant growth as supplemental irrigation with deionized water. The capacity of the soil to buffer pH and adsorb trace metals apparently counteracts the properties of acid mine water, which are detrimental to plant growth. Furthermore, the agricultural quality of a field often flooded with acid mine water has been maintained by adding lime to offset the reduced pH. Thus under certain soil conditions and management practices, acid mine water can be used for supplemental irrigation. (Knapp-USGS) W71-09816

3D. Conservation in Domestic and Municipal Use

CHARACTERISTICS OF HOUSEHOLD WATER CONSUMPTION IN THREE NEW HAMPSHIRE COMMUNITIES (APPENDIX), New Hampshire Univ., Durham. Water Resources Research Center. For primary bibliographic entry see Field 06D. W71-09563

DROUGHT AND WATER SUPPLY - IMPLICATIONS OF THE MASSACHUSETTS EXPERIENCE FOR MUNICIPAL PLANNING, Resources for the Future, Washington, D.C.; and Pittsburgh Univ., Pa. Dept. of Geography; and Clark Univ., Worcester, Mass. Dept. of Geography. For primary bibliographic entry see Field 06D. W71-09652

PRESENT OPERATIONAL PROBLEMS AND FUTURE WATER SUPPLY NEEDS IN ANKARA, TURKEY, Camp, Dresser and McKee, Boston, Mass. Robert C. Marini. Journal of the New England Water Works Association, Vol 84, No 3, p 298-308, Sept 1970. 1 fig.

Descriptors: *Water supply, *Water demand, *Project planning, *Economic feasibility. Identifiers: *Ankara, Turkey, Camp-Harris-Mesara, Cubuk, Kayas-Bayindir Dam, Kurtbogazi reservoir.

This article summarizes the findings and recommendations of a comprehensive study of the critical water supply problems in Metropolitan Ankara, Turkey, made in 1969. It discusses present and future water needs, describes the existing water supply and distribution system, and outlines a recommended five-stage, \$420 million water supply improvement program. (Holmes-Rutgers) W71-09694

A UTILITY COMPANY'S FIRST STEP INTO THE WORLD OF COMPUTERS, Brockton Edison Co., Miss. Patrick J. Murray, and Thomas H. Warner.

Journal of the New England Water Works Association, Vol 84, No 3, p 309-324, September 1970.

Descriptors: *Utilities, Computers, Economics, Data processing, Administration. Identifiers: Multi-Function Card Machine.

This article discusses the factors to be considered when a utility company is contemplating introduction of computers. Specifically, personnel, design, manufacturer, conversion, timing, and training are described. (Holmes-Rutgers) W71-09695

PUBLIC WATER SUPPLY SYSTEMS, American Water Works Association, New York.

In: Public Facility Needs, Washington, US Government Printing Office, 1966, p 105-124.

Descriptors: *Water supply, *Public utility, *Investment, *Capital costs, Water treatment, Water distribution, Population, Financing, Government supports. Identifiers: *Plant facilities, Performance standards, Water utility cost indexes, Operations, Maintenance.

This article presents a comprehensive survey of the public water supply utility industry. The nature and composition of the industry is broken down into a description of the physical characteristics, the services rendered, the standards of performance, and the existing capital plant. The costs and user charges are then dealt with, particular attention being given to construction costs, incremental costs of water facilities, typical water utility cost indexes, plant investment, and annual expense of operations and maintenance. The water utility financing and user charges incorporates explanations of both self-supporting enterprises and tax-supported enterprises. Trends in capital outlays are indicated, and projections are made for water industry needs and prospective capital outlays, in terms of population growth, depreciation, deficiencies, water rates, private investment capital, and federal assistance programs in the future. (Murphy-Rutgers) W71-09867

3E. Conservation in Industry

WATER IN THE CHEMICAL INDUSTRY, D. F. Othmer. Chemical and Process Engineering, p 142-144, Vol 5, No 6, June 1970.

Descriptors: *Water supply, *Water reuse, *Economics, Cost comparisons, *Desalination, Columbia River, Mississippi River. Identifiers: Controlled flash evaporation system, Rhine River, Egypt.

This article reviews the options available for increasing the supply of water especially for industrial uses. The author specifically describes the importance and economics of desalination and predicts that 'possibly by 1975' desalinated water may be available to large seacoast cities at a cost as low as \$0.35 - 0.40/1,000 gallons. He maintains that dual water systems although 'prohibitively expensive for existing cities' should be considered for new urban construction. He discusses the various primary, secondary and tertiary treatments of waste waters and encourages water reuse in the chemical industries. (Holmes-Rutgers) W71-09690

3F. Conservation in Agriculture

A NEW APPROACH TO DRAINAGE, Department of Agriculture and Fisheries for Scotland, Edinburgh. J. P. Struthers. Scottish Agriculture, Vol 49, No 2, p 68-71, Spring 1970. 1 reference.

Descriptors: *Drainage programs, Land reclamation, Cost comparisons, Drainage engineering. Identifiers: *Scotland, England, Macaulay Institute for Soil Research.

By using new methods of drainage, the costs of land reclamation can be substantially reduced. Several schemes are described which could be employed to improve much of Scotland's arable and grass land. (Holmes-Rutgers) W71-09477

CENTRIFUGAL PUMPS - ECONOMIC IMPLICATIONS OF SELECTION, Gujarat Cooperative Executive Development Centre, Ahmedabad (India). S. M. Patel.

Indian Farming, Vol 20, No 9, p 39-41, Dec 1970. 51, 1 table.

Descriptors: *Irrigation practices, Irrigation efficiency, Cost comparisons, Economics. Identifiers: *India, Ramlal, Fourth Five - Year Plan.

Indian farmers and therefore the agriculture of the country could benefit by careful selection of proper mechanized lift irrigation equipment. Indian farmers do not consider when purchasing centrifugal pumps whether the pump is well made or whether the pump matches the well on which it is to be installed. Pump manufacturers should hire technically trained salesmen to assist the farmer in his purchase. (Holmes-Rutgers) W71-09478

A TECHNIQUE FOR IRRIGATING BOTTOM LAND HARDWOOD TREES WITH PAPERMILL EFFLUENT IN NORTH LOUISIANA, Louisiana Polytechnic Inst., Ruston. For primary bibliographic entry see Field 05D. W71-09527

THE EFFECT OF IRRIGATION WITH MUNICIPAL SEWAGE EFFLUENT AND SLUDGE ON SELECTED TREES, GRASSES, AND LEGUMES PLANTED IN BITUMINOUS STRIP-MINE SOIL, Pennsylvania State Univ., University Park. Dept. of Forestry and Wildlife. For primary bibliographic entry see Field 05D. W71-09529

USE OF SOIL TO TREAT ANAEROBIC LAGOON EFFLUENT: DESIGN AND OPERATION OF A FIELD DISPOSAL SYSTEM, Iowa State University, Ames. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 05D. W71-09538

GROWING CORN IN GROWTH CHAMBERS WITH DIFFERENT MANURE TREATMENTS, Kansas State Univ., Manhattan. Dept. of Agricultural Engineering. Eugene Goering, R. I. Lipper, and H. L. Manges. Unpublished Paper, Presented 1971 Mid-Central Meeting American Society of Agricultural Engineers, Paper No MC-71-104, 17 p, 10 tab, 6 ref.

Descriptors: *Farm wastes, *Crop response, Disposal, Laboratory tests, Plant tissues, Growth chambers, Cattle. Identifiers: Manure, Application rates, Contamination.

The purpose of this experiment was to determine the effect on corn germination and early growth of different manure loading rates and to compare the effect of planting in manure mixed with soil against placement of seed above a manure layer. Germination and early growth of corn in plant growth chambers were adversely affected by applications of beef feedlot manure at rates ranging from 35 to 175 tons/acre, oven dry basis. The effects were dif-

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Group 3F—Conservation in Agriculture

ferent when manure was completely mixed with soil than when applied as a layer under a soil cover. (Christenbury-Iowa State)
W71-09748

POLLUTION, PESTICIDES AND THE PEOPLE -- AGRICULTURE AND OUR NATURAL ENVIRONMENT.

Greater Des Moines Chamber of Commerce, Iowa. Agricultural Dept.
For primary bibliographic entry see Field 05C.
W71-09752

THE FARMERS' CONCERN,

For primary bibliographic entry see Field 05C.
W71-09756

PESTICIDES,

Environmental Protection Agency, Washington, D.C. Pesticide Advisory Committee,
For primary bibliographic entry see Field 05C.
W71-09758

LIVESTOCK WASTE,

Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05D.
W71-09759

AGRICULTURAL BENEFITS FROM URBAN POLLUTION CONTROL,

Office of the Secretary of the Army, Washington, D.C.
For primary bibliographic entry see Field 05D.
W71-09764

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, SECOND VOLUME.

Cornell Univ., Ithaca, N. Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 06A.
W71-09465

FLOOD DAMAGE ABATEMENT STUDY FOR VIRGINIA,

Virginia Polytechnic Inst., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 06F.
W71-09467

POLITICAL AND SOCIAL BARRIERS TO WESTERN WATER DEVELOPMENT,

Idaho Univ., Moscow.
William E. Folz.
Strategies for Western Regional Water Development, Proceedings of the Western Interstate Water Conference, Corvallis, Oregon, p 72-95, 1965. 24 references.

Descriptors: *Water supply, Economics, Political aspects, Pricing, Market value.

Identifiers: *Kenneth Boulding - California Water Plan, Interagency Committee Report, TVA, Pacific Southwest Water Plan, Senate Bill 1275, U.S. Bureau of Reclamation.

If political and social barriers were to be controlled Western Water Resources would be developed satisfactorily. It would assume that market determination of water utilization would be the use to

which the water could be applied. For the most part, the economic studies in the past ten years support this thesis. When we accept this form of criteria, we lose the political compromise and expediency. People must be willing to pay collectively for the adequate supply of water. The models should be based on a certain market value. (William Campbell-Rutgers)
W71-09483

TRANSIENT SEEPAGE FLOW TOWARD TWO PARALLEL DRAINS,

Wisconsin Univ., Madison. Dept. of Mechanics; and Wisconsin Univ., Madison. Dept. of Physics; and Wisconsin Univ., Madison. Water Resources Center.
Imre Gyuk, and Gabor M. Karadi.
(1971), 16 p, 7 fig, 2 ref. OWRR Project A-029-WIS (1).

Descriptors: *Tiles, *Tile drainage, *Free surfaces, *Seepage, *Flow.

Identifiers: *Conformal mapping, *Transient seepage, *Computation, Partial differential equations.

The method of conformal mapping is applied to the analysis of transient seepage flow toward two parallel drains in a semi-infinite aquifer taking into consideration the non-linear boundary condition on the free surface. The mapping function is expressed as the power function of time and the seepage domain is mapped onto a domain of an auxiliary complex variable in such a manner that the free surface will always remain the real axis. The solution is first obtained to a single drain by neglecting the terms of the fourth on higher order. Then the solution is extended to two parallel drains by using the method of images. Calculations are carried out for different ratios of drain depth to drain spacing using various drain diameter to drain depth ratios.
W71-09560

FLOOD PLAIN INFORMATION, LENOIR, NORTH CAROLINA, LOWER CREEK, BLAIR FORK, LONG BRANCH, ZACKS FORK CREEK AND ZACKS FORK BRANCH.

Corps of Engineers, Charleston, S.C.

Army Corps of Engineers Flood Plain Report, May 1970. 72 p, 29 fig, 20 plate, 13 tab.

Descriptors: *Floods, *Flood damage, *North Carolina, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood.

Identifiers: *Lenoir (NC), Standard Project Flood, Intermediate Regional Flood.

Flooding of Lenoir, North Carolina is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. The 1940 Flood is estimated to have crested throughout the study area at stages approximately equivalent to those that would be reached by Intermediate Regional Flood. Major floods have occurred with about the same frequency on Blair Fork, Long Branch, and Lower Creek. (Woodard-USGS)
W71-09600

FLOOD PLAIN INFORMATION, TINKERS CREEK, TWINSBURG, SUMMIT COUNTY, OHIO.

Corps of Engineers, Buffalo, N.Y.

Army Corps of Engineers Flood Plain Report, April 1970. 57 p, 44 fig, 10 plate, 9 tab.

Descriptors: *Floods, *Flood plains, *Flood damage, *Ohio, Regional flood, Historic flood, Flood forecasting, Design flood, Flood control.
Identifiers: *Tinkers Creek (Summit County-Ohio), Standard Project Flood, Intermediate Regional Flood.

Flooding along Tinkers Creek in Summit County, Ohio is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections, and text material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. The stage of 10.1 feet recorded at Bedford July 20, 1969 was the maximum stage of record since the gage was installed in 1962. The storm was centered approximately 3 miles southwest of the Bedford gage. Of the 5.60 inches of rain that fell in this area during a 24-hour period, the majority was recorded between 11:15 a.m. and 1:15 p.m. Since the stream slopes of the main stem and tributaries are fairly steep in this region, the majority of this precipitation was rapidly transported to the Bedford gage, peaking at 4:30 p.m. (Woodard-USGS)
W71-09601

PROCEEDINGS, MISSISSIPPI WATER RESOURCES CONFERENCE, 1971.

Mississippi State Univ., State College. Water Resources Research Inst.
For primary bibliographic entry see Field 05G.
W71-09628

A GENERALIZED PROBABILISTIC APPROACH TO REGIONAL WATER SUPPLY ASSESSMENT,

Environmental Dynamics, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 06A.
W71-09735

A CASE STUDY OF WATER RESOURCES DEVELOPMENT - AN ANALYSIS OF A PROPOSED PROJECT ON THE MISSOURI RIVER,

Cornell Univ., Ithaca. Water Resources and Marine Sciences.
For primary bibliographic entry see Field 06B.
W71-09740

MANAGEMENT OF WATER QUALITY IN RELEASES FROM SOUTHWESTERN IMPOUNDMENTS,

Texas Univ., Austin. Environmental Health Engineering Program.
Herman M. Clay, Jr., and E. Gus Fruh.
(1971), 22 p, 7 fig, 2 tab, 20 ref. OWRR Project B-040-TEX (2).

Descriptors: Stratification, *Withdrawal, *Impoundments, Water quality, Reservoirs, Water utilization, *Water management (Applied), Discharge (Water), Model studies.
Identifiers: *Selective withdrawal, Southwestern US, Bohan-Grace solution.

The objective was to determine the selectivity of withdrawal which is possible in southwestern reservoirs. Two stratified flow solutions were examined to test their applicability under field conditions. Although both appeared capable of accurate prediction of the outflow velocity profile, the Bohan-Grace solution, which required less input data, was utilized to predict the chemical constituents of single and simultaneous releases from several southwestern impoundments. Prediction of outflow water quality was within fifteen percent for southwestern reservoirs as shallow as fifty-five feet. The withdrawal layer thickness for the subject Texas impoundments included the entire hypolimnion or epilimnion depending on outlet location. The sensitivity of the velocity profile to seasonal changes, reservoir discharge rate and withdrawal port dimensions also is illustrated. (See also W71-06193 and W71-09743)

W71-09742

SELECTIVE WITHDRAWAL AS A WATER QUALITY MANAGEMENT TOOL FOR SOUTHWESTERN IMPOUNDMENTS, Texas Univ., Austin. Environmental Health Engineering Program.
E. Gus Fruh, and Herman M. Clay, Jr.
(1971), 22 p, 8 fig, 2 tab, 13 ref. OWRR Project B-040-TEX (3).

Descriptors: Stratification, *Withdrawal, *Impoundments, Water quality, Reservoir, Water utilization, *Water management (Applied), Discharge (Water), Model studies.
Identifiers: *Selective withdrawal, Southwestern US, Bohan-Grace solution.

The objective was the development of a preliminary simulation model of impoundment water quality that included an accurate description of stratified flow and selective withdrawal. Two stratified flow solutions were examined to test their applicability to describe reservoir withdrawal hydraulics under field conditions. Although both appeared capable of accurate prediction of the outflow velocity profile, the Bohan-Grace solution, which required less input data, was selected allowing application to impoundments for which field data are minimum. The simulation model, including the Bohan-Grace Solution for reservoir withdrawal hydraulics, was assessed for a two-year period for which sufficient field data were available. The error in penstock temperature prediction ranged from 0 to 5F. (See also W71-06193 and W71-09742)
W71-09743

FLOOD PLAIN INFORMATION, MORGANTON, NORTH CAROLINA - VOLUME 2. CATAWBA RIVER, SILVER CREEK AND BAILEY FORK.
Corps of Engineers, Charleston, S.C.

Army Corps of Engineers Flood Plain Report, January 1970. 54 p, 9 fig, 16 plate, 14 tab.

Descriptors: *Floods, *Flood damage, *North Carolina, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood.
Identifiers: *Morganton (North Carolina), Standard Project Flood, Intermediate Regional Flood.

Flooding of Catawba River, Morganton, North Carolina is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. The largest known flood recorded on the Catawba River in the Morganton area occurred in July 1916. The river rose at Morganton to about 41 feet above normal at the foot of Green Street, 17 feet above the highest water ever before recorded there. (Woodard-USGS)
W71-09845

FLOOD PLAIN INFORMATION, ALBUQUERQUE ARROYOS, PART 1, ALBUQUERQUE, NEW MEXICO.
Corps of Engineers, Albuquerque, N. Mex.

Army Corps of Engineers Flood Plain Report, June 1970. 34 p, 5 fig, 11 plate, 1 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *Urbanization, *New Mexico, Regional flood, Flood forecasting, Flood control.
Identifiers: *Albuquerque (N Mex), Standard Project Flood, Intermediate Regional Flood.

Flooding along the numerous Arroyo Channels in or adjacent to the City of Albuquerque, New Mexico is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights, and other technical data. Application of loss rates used in the design of the Albuquerque North Diversion Channel to the critical distribution of 100-year rainfall amounts will produce a total runoff of 1.92 inches over a 6-hour period; rainfall losses would be 0.50 inches for the first hour and 0.16 inches per hour for subsequent periods. For study purposes, all mesa areas were assumed to be developed. (Woodard-USGS)
W71-09846

4B. Groundwater Management

A PRELIMINARY 'LEAST COST' STUDY OF FUTURE GROUNDWATER DEVELOPMENT IN NORTHEASTERN ILLINOIS, Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 05D.
W71-09539

HYDRAULIC TESTING AND SAMPLING OF WATER WELL NUMBER 1, PROJECT WAGON WHEEL, SUBLETTE COUNTY, WYOMING, Geological Survey, Denver, Colo.
Paul T. Voegeli, Sr.

Geological Survey Open-file Report, USGS-474-87 (AEC), March 1971. 26 p, 7 fig, 3 tab, 2 ref. USAEC Agreement No AT (29-2)-474.

Descriptors: *Hydrogeology, *Aquifer characteristics, Water wells, Transmissivity, Specific capacity, On-site tests, Water yield, Water levels, Drawdown, Water supply, Data collections, Sampling, Hydrologic data.
Identifiers: Pumping tests, *Aquifer tests.

The Wagon Wheel Water Well No. 1 was drilled to obtain hydraulic data and to provide a water supply for the deep drilling program at the site of Project Wagon Wheel, which is aimed at determining the feasibility of nuclear stimulation of natural gas reservoirs. The well was tested and water samples were collected by swabbing on August 1, 1969, and by pumping on August 26, 1969. In both tests the 760-meter section through which the well was drilled was tested through 19 gun-perforated intervals. The water level in the well prior to the pumping test was 29.9 meters below land surface. During the pumping test the water level declined to 47.7 meters below land-surface datum while the well was pumped at an average rate of 281 cubic meters per day for 6 hours and 6 minutes. The transmissivity of the aquifer in the vicinity of the well was 26 cubic meters per day per meter and the specific capacity was 16 cubic meters per day per meter of drawdown. (Knapp-USGS)
W71-09593

HYDROGEOLOGY OF THE CARBONATE ROCKS OF THE LANCASTER 15-MINUTE QUADRANGLE, SOUTHEASTERN PENNSYLVANIA, Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 02F.
W71-09594

EVALUATION OF THE MADISON LIMESTONE IN THE WILLISTON BASIN FROM WELL LOGS AND CORES, Bureau of Mines, Laramie, Wyo., Energy Research Center.
For primary bibliographic entry see Field 02F.
W71-09595

GROUNDWATER RECONNAISSANCE STUDY OF SELECTED SITES IN ROCKY MOUNTAIN NATIONAL PARK AND SHADOW MOUNTAIN NATIONAL RECREATION AREA, Geological Survey, Denver, Colo.
Frank A. Welder.
Geological Survey Open-file Report 71001, March 1971. 47 p, 16 fig, 3 tab, 5 ref.

Descriptors: *Water resources development, *National parks, *Colorado, *Water wells, *Water yield, Water supply, Geology, Hydrogeology, Hydrologic data, Data collections.
Identifiers: *Rocky Mountain National Park, *Shadow Mountain Recreation area.

The groundwater supply potential at 30 sites within the Rocky Mountain National Park and Shadow Mountain National Recreation Area was evaluated by the U.S. Geological Survey in 1967 and 1968. The work consisted of a geohydrologic reconnaissance, well inventory, and test drilling. The sites are underlain by Precambrian crystalline rocks, Tertiary sediments, or Quaternary glacial and alluvial deposits. The crystalline rocks are generally poor aquifers; some wells intercepting fractures may yield as much as 10 gallons per minute from wells 100 to 200 feet deep. Wells drilled in Tertiary sandstones to a depth of 50 to 500 feet may supply 1 to 50 gpm. Wells in unconsolidated glacial and alluvial deposits yield the largest supplies of groundwater in the Rocky Mountain National Park. These deposits commonly can supply 5 to 100 gpm to wells. (Knapp-USGS)
W71-09597

HYDRAULIC TESTING OF THE OJO ALAMO SANDSTONE IN HOLE GB-3, PROJECT GASBUGGY, RIO ARriba COUNTY, NEW MEXICO, Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05B.
W71-09599

WATER RESOURCES OF THE SLAGLE-SIMPSON-FLATWOODS AREA, LOUISIANA, Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 02F.
W71-09657

WATER WITCHING U.S.A., E. Z. Vogt, and R. Hyman.
Chicago, University of Chicago Press, 1959, 248 p.

Descriptors: *Dowsing, *Water wells, Groundwater, Exploration.
Identifiers: Water witching, Water well location, Magical divination.

For centuries a common figure on the rural horizon has been the man with the charmed forked stick - the water witch, upon whose supposed supernatural powers the hopes of many a country farmer have depended. A quaint superstition, some say, but it is a superstition that has persisted and is still widely practiced, despite the advances of science and technology. The authors of this book address themselves to this magical, non-scientific practice that has continued in an age of surmised rationality. Drawing on the authors' extensive backgrounds in anthropology, social psychology, and professional magic, they have studied water witching and water diviners as objectively and sympathetically as possible. They recognize the important role that magic plays in all societies, and they also recognize the very real problems of water shortage that underlie the continued dependence on the divining rod in many parts of the United States, despite the fact that there is no scientific evidence that water witching works. This is a necessity for all groundwater supply workers. (Campbell-NWWA)
W71-09722

CAN GROUNDWATER POLLUTION BE AVOIDED, Missouri Geological Survey, Rolla.

Field 04—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B—Groundwater Management

For primary bibliographic entry see Field 05B.
W71-09729

COST OF WELLS AND PUMPS,
Illinois State Water Survey, Urbana.
William C. Ackermann.
Groundwater, Vol 7, No 1, p 35-37, January-February 1969, 6 fig.

Descriptors: *Water costs, *Groundwater, Water wells, Water rates.
Identifiers: *Well costs, *Pump costs, Sand and gravel wells, Shallow bedrock wells, Deep sandstone wells, Pumping rates.

The use of this material will give an estimate of the well and pump costs for projects requiring a given capacity. This is intended only as an instrument for establishing orders of magnitude as a basis for comparisons, and of course does not substitute for detailed engineering studies. Well cost data were analyzed for three categories according to the aquifer tapped: sand and gravel, shallow bedrock, and deep sandstone. In the sand and gravel category, tubular and gravel packed wells finished in the glacial materials above bedrock were considered separately. (Campbell-NWWA)
W71-09730

COST OF PUMPING WATER,
Illinois State Water Survey, Urbana.
William C. Ackermann.
Groundwater, Vol 7, No 1, p 38-39, January-February 1969.

Descriptors: *Water costs, *Groundwater, Water wells, Water distribution (Applied), Water rates, Pumps.
Identifiers: *Pumping costs (Wells), Power requirements.

Use of this material will assist in the determination of cost of pumping water, given the quantity of flow required, the total pumping head, the wire-to-water efficiency, and the unit cost of power. A table of conversions is presented to aid in reducing theoretical equations to simplified equations, and a figure is provided for graphical solutions of the equations. (Campbell-NWWA)
W71-09731

LOW RESISTIVITY ON ELECTRIC LOG COULD MEAN 'CHERT',
Schlumberger Well Surveying Corp., Tulsa, Okla.
A. H. Heim, and H. W. Truc.
World Oil, Vol. 142, No. 4, p. 126, 129-130, March 1956, 7 fig.

Descriptors: *Logging (recording), *Aquifer characteristics, Electric logging, Chert, Ground water, Oil industry.
Identifiers: *Electric log interpretation, Rock drillability.

Low resistivities frequently shown on electrical logs in 'Mississippi chert' sections have been attributed to a combined result of: (1) high porosities, (2) high formation water salinities, (3) possible interbedded shales. Cores from the Mississippian chert zones of some Oklahoma and Kansas wells were analyzed to find the causes for low resistivities frequently shown by such formations on electrical survey logs. All cores were a heterogeneous mixture of microcrystalline quartz material and siliceous shale. The quartzitic material (chert) varied from a dense, flint-like form to a chalky and porous form; porosities up to 40 percent were not uncommon and formation factors were as low as 5. Cores contained no conductive minerals PER SE. (Campbell-NWWA)
W71-09906

CYCLIC PUMPING FOR DRAINAGE PURPOSES,
California Univ., Davis.
G. Aron, V. H. Scott, and M. A. Abu-Zied.

Ground Water, Vol. 5, No. 1, p 35-38, January 1967, 2 tab., 2 fig., 3 ref.

Descriptors: *Water wells, *Pumps, *Aquifer characteristics, Ground water.
Identifiers: *Hydraulics of cyclic pumping, Cyclic pumping design.

Criteria and formulas are presented for scheduling cyclic pumping operations, to maintain a given minimum drawdown as required for drainage purposes. Keeping the total cycle length constant, the pumping periods are successively shortened and the shutoff periods lengthened. Solutions of the equation for the relative length of the shutoff periods are presented in a family of curves, which greatly simplifies the scheduling procedure. (Campbell-NWWA)
W71-09907

THE GROUND WATER CONSULTANT LOOKS TO THE DRILLER,
Guyton (William F) and Associates, Austin, Tex.
For primary bibliographic entry see Field 08A.
W71-09908

APPLICATION AND LIMITATION OF METHODS USED TO ANALYZE PUMPING TEST DATA,
Illinois State Water Survey, Urbana.
William C. Walton.
Water Well Journal, Vol 15, Nos. 2 and 3, Part 1, p. 22, 49, 50, 53, 56; Part 2, p. 20, 46, 48, 50, 52, February and March 1960, 2 tab., 5 fig., 13 ref.

Descriptors: *Water wells, *Aquifer characteristics, *Ground water, This formula, Jacob and Cooper formula, Boulton formula, Specific capacity, Transmissibility.
Identifiers: *Pump tests (wells), Hydraulic properties.

The nonequilibrium formula is widely used with pumping test data for determining the hydraulic properties of an aquifer. The most popular method for solving that formula is the straight-line method because of its simplicity of application and interpretation. However, the straight-line method is not applicable in some cases and it supplements, rather than supersedes, the more complicated type-curve method. Geologists and engineers have become familiar with the interpretation of time-drawdown graphs. Distance-drawdown graphs (radial profiles of cones of depression) have, on the other hand, received little publicity and they are not used as much as they ought to be to determine the hydraulic properties of aquifers and to confirm the existence of geohydrologic boundaries. Under complex aquifer conditions, early time-drawdown data can be misleading because of the inability of some aquifers to respond to pumping instantaneously as would a homogeneous, isotropic, and perfectly elastic artesian aquifer. Distance-drawdown data can be used to great advantage in the interpretation of early time-drawdown data. Under water-table conditions, the nonequilibrium formula does not describe completely the drawdown in wells during short periods of pumping. The gravity drainage of water through stratified sediments is not immediate and the unsteady flow of water towards a well in an unconfined aquifer is characterized by slow drainage of interstices. Thus, the coefficient of storage is not constant as assumed in the derivation of the nonequilibrium formula but varies and increases at a diminishing rate with the time of pumping. However, data collected towards the end of a pumping test, one or more days in duration, can in many cases by used to determine the hydraulic properties of an aquifer under water-table conditions. (Campbell-NWWA)
W71-09911

MODERN DESIGN TECHNIQUES FOR EFFICIENT HIGH CAPACITY IRRIGATION WELLS,
Universal Oil Products, St. Paul, Minn. Johnson Div.

For primary bibliographic entry see Field 08A.
W71-09913

MASTER THE TOOLS THAT COMBAT CORROSION,
Corrosion Mitigation Inc., Marietta, Ga.
For primary bibliographic entry see Field 08G.
W71-09915

APPLICATIONS OF ACETIC ACID TO WELL COMPLETION, STIMULATION AND RECONDITIONING,
Halliburton Co., Duncan, Okla.
For primary bibliographic entry see Field 08A.
W71-09917

WELL DATA GLOSSARY,
American Petroleum Inst., Dallas, Texas.

A.P.I. Bulletin D-12, First Edition, April 1966. 115 p.

Descriptors: *Information retrieval, *Oil industry, Data Collections, Drilling, Wells.
Identifiers: *Well data terms, Standardization of terms, Data Abbreviations.

This Well Data Glossary is intended to present a list of suggested standards for well data terms that are in common use by the oil industry, particular in intercompany data systems, such as the Permian Basin Well Data System and the Rocky Mountain Well History Control System. With the oil industry involved in converting data to a machine retrievable form from literally hundreds of thousands of wells, the advantages of standardization become clear when the cost of making the Permian Basin, the Rocky Mountain and a company well data system machine compatible is reckoned. When changes are made in an external data system, costs are again increased by the necessary reprogramming of that system and the resulting changes in the company system. The more standards that each system accepts, the more time and money that is saved by the companies individually and collectively. The Glossary is designed for many users. Standard terms and abbreviations are for the data collectors, scouts, and commercial data companies. The codes, abbreviations and data fields are for those working with data conversion and retrieval problems. One of the primary uses for the Glossary is to define the data elements - those items requiring data fields. (Campbell-NWWA)
W71-09919

4C. Effects on Water of Man's Non-Water Activities

NATIONAL CONFERENCE ON URBAN WATER RESEARCH, KEYNOTE AND PLenary SESSION PAPERS.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 06B.
W71-09468

A NATIONAL URBAN WATER RESOURCES RESEARCH PROGRAM.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 06B.
W71-09469

EROSION AND SEDIMENTATION FOLLOWING ROAD CONSTRUCTION AND TIMBER HARVEST ON UNSTABLE SOILS IN THREE SMALL WESTERN OREGON WATERSHEDS,
Forest Service, Portland, Ore. Pacific Northwest Forest and Range Experiment Station.
R. L. Fredricksen.
Forest Service Research Paper PNW-104, 1970. 15 p, 5 fig, 4 tab, 15 ref.

Descriptors: *Landslides, *Sediment yield, *Clear-cutting, *Roads, *Oregon, Forest management, Sedimentation, Soil erosion, Erosion, Road construction, Watershed management, Cutting management, Lumbering.
Identifiers: Patch-cutting, *Logging roads.

In two steep headwater drainages in Oregon landslides were the predominant source of increased sedimentation of streams following timber harvest. Patch-cut logging with forest roads increased sedimentation relative to a control by more than 100 times over a 9-year period. Landslide erosion was greatest where roads crossed high gradient stream channels. In an adjacent clearcut watershed with no roads, sedimentation increased three times that of the control. (Knapp-USGS)
 W71-09655

RUNOFF OF DEICING SALT: EFFECT ON IRONDEQUOIT BAY, ROCHESTER, NEW YORK,
 Rochester Univ., New York. Dept. of Geological Sciences.
 For primary bibliographic entry see Field 05B.
 W71-09803

4D. Watershed Protection

WATER WATER,
 Department of Environmental Protection, Trenton, N. J. Bureau of Fisheries Management.
 Hill Zich.
 Article in two parts. New Jersey Outdoors, Vol 21, No 4 and 5, p 2-9, p 7-13, Jan and Feb 1971. 13 figures.

Descriptors: *Water resources development, Water pollution control, Administration, Recreation demand, Social participation.
Identifiers: *Division of Fish, Game and Shell Fisheries, State Department of Health, National Committee on Natural Resources.

The present and future situation in regard to the world's water resources is described stressing the importance of public initiative in planning the future. The major causes of water pollution are pointed out. Implementation of the existing laws provides the most direct means of curing these pollution problems. (Holmes-Rutgers)
 W71-09484

CONSEQUENCES OF HISTORIC RAINFALL ON WESTERN IOWA FARMLAND,
 Agricultural Research Service, Columbia, Mo. Soil and Water Conservation Research Div.
 For primary bibliographic entry see Field 02J.
 W71-09609

SEDIMENT: EVERYBODY'S POLLUTION PROBLEM,
 Soil Conservation Service, Washington, D.C.
 For primary bibliographic entry see Field 05B.
 W71-09760

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

RADIATION SURVEILLANCE NETWORK.
 Division of Operational Safety (AEC), Washington, D.C.

WASH-1148, Nov 1969. 140 p, fig, tab.

Descriptors: *Environment, *Monitoring, *Air pollution, *Water pollution, Water pollution sources, *Water pollution control, Population, Data collections, Data processing, Data transmission.

The purpose is to bring into one reference document a description of the major radiation surveillance and monitoring programs conducted by organizations within the United States, Canada, and Mexico. These programs described here were selected on the basis that they provide published data which is routinely available to the scientific community and the public. (Houser-NSIC)
 W71-09489

ENVIRONMENTAL MONITORING REPORT JULY-DECEMBER 1969 and 1969 SUMMARY,
 Mound Lab., Miamisburg, Ohio.
 H. F. Anderson, and W. E. Sheehan.
 Availability: NTIS. MLM-1616, Dec 1969. 50 p, 3 fig, 11 tab.

Descriptors: *Environment, *Air pollution, *Water pollution, Water pollution sources, *Water pollution control, Radioisotopes, Radioactive waste disposal, Rivers, Regulation, Standards.

The concentration of radioactive materials detected in the environment surrounding Mound Laboratory, Miamisburg, Ohio, is presented for the second half of 1969, and a summary is presented for the entire year. The average concentration of radionuclides from Mound Laboratory in the Great Miami River and in the environmental air was within the stringent standards of safety specified by the Atomic Energy Commission. (Houser-NSIC)
 W71-09490

A RAPID-FIELD SAMPLING SYSTEM FOR TRITIUM IN ATMOSPHERIC HYDROGEN,
 Miami Univ., Fla.
 H. G. Ostlund.
 Availability: NTIS. TID-25345, Feb 1, 1970. 6 p.

Descriptors: *Tritium, *Measurement, *Instrumentation, *Sampling, *Air pollution, *Pollutants, Hydrogen, Oxygen, Water, Design criteria, Specifications.

A prototype field sampling system is presented for tritium in atmospheric hydrogen. Within a few weeks it will begin to undergo test, and final specifications will be determined. The machine will collect simultaneously one sample of atmospheric HTO, and one of HT, for each sampling period of 5 to 15 minutes. It is designed for use in an automobile or in an aircraft with pressurized cabin. During the remaining part of the first contract year, we will take the field unit in a car, station wagon or small van, and drive through a cold front collecting samples of atmospheric HTO and HT from both air masses. (Houser-NSIC)
 W71-09491

RADIOACTIVE FALLOUT IN AIR AND RAIN--RESULTS TO THE MIDDLE OF 1969,
 Atomic Energy Research Establishment, Harwell (England).
 R. S. Cambray, E. M. Fisher, W. L. Brooks, and D. H. Pierson.
 Availability: NTIS. AERE-R-6212, Nov 1969. 52 p.

Descriptors: *Sampling, *Atmosphere, *Air pollution, *Fallout, Measurement, Analytical techniques, Radioisotopes, Precipitation (Atmospheric), Tritium, Cesium, Strontium radioisotopes, Deposition (Sediment).

Sampling of dust and rainwater from the United Kingdom and elsewhere is reported. Results are presented of analyses of these samples for various fission products and certain other radionuclides. (Houser-NSIC)
 W71-09492

RADIATION DOSIMETRY, CORRELATION, AND DATING OF CALCAREOUS DEEP-SEA CORES,
 Dartmouth Coll., Hanover, N.H.
 N. M. Johnson.
 Availability: NTIS. NYO-3860-2, Feb 15, 1969. 103 p.

Descriptors: *Cores, *Age, *Geologic formations, *Oceans, *Sedimentary basins (Geological), *Radioactive dating, Mineralogy, Trace elements, Hydrologic data.

The method of obtaining geologic age relationships from the radiation dosimetry of natural thermoluminescence has been evaluated for deep-sea sediments. Dosimetry values and alpha activities were measured at intervals along five cores of foraminiferal lutite which collectively represent a complete stratigraphic section of the pleistocene. The mineralogy and concentrations of some trace elements in the cores were also determined and their effect on the natural thermoluminescence analyzed. (Houser-NSIC)
 W71-09494

A QUICK METHOD FOR THE RADIOCHEMICAL DETERMINATION OF CESIUM-137 IN WATER (IN GERMAN),
 Staatliche Zentrale fuer Strahlenschutz, Berlin (East Germany).
 W. Rehak, and G. Ubl.
 Availability: USAEC Depository Libraries in the U.S. and overseas. SZS-1/70, Jan 1970. 7 p, 2 fig, 6 ref.

Descriptors: *Cesium, *Radiochemical analysis, *Water, *Ion exchange, *Absorption, Measurement, Radiation.
Identifiers: Beta activity.

The radiochemical determination of CS-137 in water samples free of suspended matter is performed by an ion exchange procedure with ammonium molybdophosphate (AMP) and measuring the beta activity of the ion exchanger. A simple procedure for the preparation of AMP with good exchanging properties is described. (Houser-NSIC)
 W71-09511

MEASUREMENTS OF BOMB-PRODUCED RADIOCARBON IN THE SURFACE AND SUBSURFACE WATERS OF THE PACIFIC OCEAN,
 Scripps Institution of Oceanography, La Jolla, Calif.
 H. E. Suess.
 Availability: NTIS. UCSD-34-P-163-X-1, March 1, 1970. 17 p.

Descriptors: *Monitoring, *Carbon, *Activated carbon, *Pacific ocean, Sampling, Analytical techniques.
Identifiers: Concentration, Counter.

Progress is reported during the year 1970 of the La Jolla program for monitoring the Carbon-14 content of surface seawater in the Pacific Ocean. Additional plans of sampling and the moving of the laboratory are also reported. (Houser-NSIC)
 W71-09513

PHOSPHATE MEASUREMENTS IN NATURAL WATERS, A CRITIQUE,
 Minnesota Univ., Minneapolis. Limnological Research Center.
 William Chamberlain, and Joseph Shapiro.
 Available from the National Technical Information Service as PB-200 824, \$3.00 in paper copy, \$0.95 in microfiche. Completion Report, Contribution No 103, 1971. 20 p, 1 tab, 37 ref. OWRR Project B-099-Minn (4).

Descriptors: *Phosphates, *Lakes, Ecosystems, Minnesota, Hydrolysis, Ion-Exchange, Tracer, Bioassay, Arsenate, Seston, Analytical techniques, *Pollutant identification, Water pollution effects.
Identifiers: *Molybdenum blue method, Acid labile inorganic phosphate, Hidden blank error, Spectrophotometer, Dissolved phosphate.

The so-called molybdenum blue method for assaying the inorganic phosphate concentration of solutions is well established in scientific circles. Numerous modifications of the method have appeared and the method is the basis of almost all routinely

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification of Pollutants

employed techniques for assaying phosphate in natural waters. This study was concerned with what, specifically, is being measured by the molybdenum blue method and whether or not the method is providing valid estimates of the dissolved inorganic phosphate concentration of natural waters. It is concluded that neither a hidden blank error or the hydrolysis of organic phosphate esters will seriously bias the results obtained by the molybdenum blue method. Except in instances where arsenate is a problem, the molybdenum-reactive material present in natural waters may be regarded as inorganic phosphate, although not necessarily as free phosphate ion. Any attempt to differentiate or define phosphorus availability without considering the time element is futile. If investigators continue to measure concentrations of dissolved inorganic phosphorus and refer to them as such that they be aware of certain problems and attempt to circumvent them. The adoption of a technique for surface waters is urged such as a 6-second procedure where arsenic is definitely shown to be absent, or a short period (e.g. 10 seconds) extraction technique where arsenic is, or may be, present, either method to be done on 0.5 micron filtered water. Only in this way will 'soluble reactive phosphorus' and 'dissolved inorganic phosphorus' begin to approach each other and only then, perhaps, will phosphate concentration estimates become meaningful. (See also W71-09564)

W71-09557

MECHANICAL SAMPLER FOR DETERMINING THE WATER QUALITY OF EPHEMERAL STREAMS,

Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.

S. Knedlhans.

Water Resources Research, Vol 7, No 3, p 728-730, Jun 1971. 3 p, 3 fig, 1 ref.

Descriptors: *Sampling, *Equipment, *Ephemeral streams, Monitoring, Water quality, Pollutant identification.

Identifiers: *Automatic samplers.

A simple mechanical system for automatically sampling small ephemeral streams is described. A rack fitted with two columns of bottles and a float assembly permits sampling of both rising and falling stages at predetermined water depths. (Knapp-USGS)

W71-09613

STATISTICAL LIMITS OF ACCURACY AND PRECISION OF GROSS ALPHA AND BETA RADIOACTIVITY MEASUREMENTS IN WATER,

Northeastern Radiological Health Lab., Winchester, Mass.

Edmond J. Baratta, and Forrest E. Knowles, Jr. Radiological Health Data and Reports, Vol 12, No 4, p 195-198, April 1971. 4 p, 6 tab, 4 ref.

Descriptors: *Monitoring, *Radioactivity, *Pollutant identification, *Public health, *Statistics, Background radiation, Water analysis, Radiochemical analysis, Water quality, Sampling. Identifiers: Alpha and beta radioactivity analysis (Water).

This paper presents the results of a technical experiment designed to determine the effectiveness of measurements for gross alpha and beta radioactivity in water. Since this analysis is normally used as a 'screening' technique, it is essential that the limits of precision and accuracy of the method be known. Gross measurements are still being used in preoperational reactor surveys as an indication of the 'background' levels and to monitor radioactivity when the reactor becomes operational. In addition, the Public Health Service standard for drinking water has, in lieu of a determination of radium-226 and strontium-90, limits for gross alpha and beta radioactivity, respectively. The precision and accuracy of a standard method for analysis of gross

alpha and beta radioactivity in water were determined through the cooperation of private and government laboratories. It was found that gross alpha radioactivity could be determined with an overall precision of 12%, while the gross beta radioactivity could be determined with a precision of 7%. The accuracy of the gross alpha activity measurements was within 10%, and for the gross beta activity measurements, 1%. (Knapp-USGS)

W71-09626

ESTABLISHMENT OF AN AUTOMATIC WATER QUALITY SURVEILLANCE PROGRAM,

Corps of Engineers, Mobile, Ala. Environmental Quality Section.

For primary bibliographic entry see Field 05G.

W71-09634

ECHINODERMS: AN AUTORADIOGRAPHIC STUDY OF ASSIMILATION OF DISSOLVED ORGANIC MOLECULES,

Newcastle-upon-Tyne Univ. (England). Dept. of Zoology; and Newcastle-upon-Tyne Univ. (England). Dove Marine Lab.

For primary bibliographic entry see Field 05C.

W71-09662

ON THE SIGNIFICANCE OF METAL COMPLEXING AGENTS IN SECONDARY SEWAGE EFFLUENTS,

Michigan Univ., Ann Arbor. Dept. of Environmental Health.

For primary bibliographic entry see Field 05B.

W71-09674

SHORT-TERM FLUORESCENCE AND DISSOLVED OXYGEN RELATIONSHIPS IN THE UPPER CHESAPEAKE BAY,

Maryland Univ., Solomons. Natural Resources Inst. David A. Flemer, and Robert B. Biggs.

Chesapeake Science, Vol 12, No 1, p 45-47, March 1971. 2 fig, 7 ref.

Descriptors: *Dissolved oxygen, *On-site data collections, *Phytoplankton, *Fluorescence, *Sampling, On-site investigations, Hydrologic data, Pigments, Chlorophyll, Data collections, Heterogeneity.

Identifiers: *Chesapeake Bay, Chlorophyll a.

Short-term variations in fluorescence (chlorophyll a) and dissolved oxygen were recorded from a fixed station between 6 and 7 m over 12 m of water in upper Chesapeake Bay. The late afternoon curves showed a positive relationship and the early evening curves exhibited an inverse correspondence. The observed oscillations could result from internal waves but the variations in space and time may represent discrete patches of phytoplankton that move past the fixed sampling point. These results have important ecological consequences and may, or should, affect future sampling regimes of the estuary. (LeGore-Washington)

W71-09681

ROLE OF EXCRETED CHLORTETRACYCLINE IN MODIFYING THE DECOMPOSITION PROCESS IN FEEDLOT WASTE,

Colorado State Univ., Ft. Collins. Dept. of Microbiology.

For primary bibliographic entry see Field 05C.

W71-09749

RAPID CONCENTRATION OF STRONGYLE EGGS FROM EQUINE FECES FOR IN VITRO STUDIES,

Louisiana State Univ., Baton Rouge. Dept. of Veterinary Science.

Thomas R. Bello, and Virginia L. Gordon.

American Journal of Veterinary Research, Vol 31, No 12, p 2285-2288, December, 1970, 1 tab, 7 ref.

Descriptors: *Farm wastes, Laboratory tests, Nematodes, Eggs, *Separation techniques, Pollutant identification.

Identifiers: Equine, Horse, Laboratory procedures, *Strongyle eggs.

For in vitro studies, large numbers of strongyle eggs in equine feces were suspended, sieved, sedimented in water, and then floated in sucrose solution by centrifugation. The eggs were prepared for cultures by disinfecting with 1.2 to 1.3% sodium hypochlorite solution and washing in sterile Tyrode's solution containing antibiotics. This rapid concentration technique was 100.2 ± 2.2% efficacious based on eggs-per-gram (e.p.g.) fecal counts from 20 horses. (Christenbury-Iowa State)

W71-09750

POLLUTION, PESTICIDES AND THE PEOPLE - AGRICULTURE AND OUR NATURAL ENVIRONMENT.

Greater Des Moines Chamber of Commerce, Iowa. Agricultural Dept.

For primary bibliographic entry see Field 05C.

W71-09752

WHAT DO WE MEAN BY POLLUTION,

Iowa State Univ., Ames. Dept. of Economics.

Charles Gratto.

In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 1-6.

Descriptors: *Environment, *Water quality, Water pollution effects, Standards, Waste disposal, Ecosystems, Costs, Taxes, Prices.

Identifiers: *Socioeconomic characteristics, Fines and penalties, Adversary situation, Inducements.

Environmental quality is measured by some standard, such as content, and by performance. We can measure environmental quality by comparing an existing content with a desired content. Likewise, we can evaluate environmental quality by comparing an existing level of performance with a desired level of performance. One important performance characteristic of environment is balance over time. The content and performance standards we apply to the environment let us determine if this dynamic balance is being maintained. Problems of environmental quality would be easier to solve if we knew the tolerable levels of concentration for all kinds of matter and energy that a relevant to managing the environment. Public policies for reaching a desired level of quality include learning, fines and penalties, the adversary situation, inducements and cooperation, taxation, and the price system. (See also W71-09752) (White-Iowa State)

W71-09753

DETERMINATION OF MERCURY BY USING A GOLD TRAP IN SAMPLES CONTAINING CONSIDERABLE SULFIDE MINERALS,

Geological Survey of West Malaysia, Ipoh.

P. C. Leong, and H. P. Ong.

Analytical Chemistry, Vol. 43, No. 7, June, 1971, p. 940-941, 1 fig., 2 tab.

Descriptors: Equipment, Absorption, *Pollutant identification, Analytical techniques.

Identifiers: *Mercury, Reagents, Dithizone, Gold trap, Sulfide minerals.

This article offers a suitable method for determining microamounts of mercury in soil and rock samples which may contain considerable amounts of sulfide minerals. The equipment consists of a borosilicate test tube 19 mm o.d. x 150 mm joined to an L-shaped borosilicate glass tubing of 9 mm (o.d.). The horizontal part of the tubing holds a column of cut up gold foil. The other end of the tubing is dipped into an absorbing mixture consisting of 0.2 M potassium permanganate solution diluted with an equal volume of 10 percent sulfuric acid. Dithizone, 0.0015 percent, was prepared fresh daily by diluting 15 ml of 0.01 percent solution to 100 ml with chloroform. A test tube con-

taining the absorption mixture was placed in a flask which was in turn connected to a suction pump. The sample is heated and suction pressure is applied. The absorption mixture is decolorized with a slight excess of sulfurous acid, and 1 ml of dithionite solution is added. Mercury content is determined by comparing the color of the organic layer in the organic layer in the absorbing mixture with the set of standards. Results from tests using synthetic samples indicate that the method gives reasonably good results and should be useful to laboratories having no sophisticated instruments. (Upadhyaya-Vanderbilt)
W71-09771

THE COMPLEX CHEMISTRY OF METHYL-MERCURY CATIONS (IN GERMAN), Eidgenössische Technische Hochschule, Zurich (Switzerland). Lab. of Inorganic Chemistry. G. Schwarzenbach, and M. Schellenberg. *Helvetica Chimica Acta*, Vol. 48, Fasciculus 1 (1965), No. 3, p. 28-48, 3 fig., 19 ref.

Descriptors: *Heavy metals, *Chemical reactions, Metals, Analytical techniques, Organic compounds, Carbohydrates, Path of pollutants, Biochemistry, Chemical properties, Water pollution sources, Pollutant identification.
Identifiers: *Mercury, Mercury pollution, *Methylmercury.

The stability constants of the methylmercury complexes CH_3HgL - λ have been determined (Table 1). Like H^+ , the cation CH_3Hg^+ reveals the coordination number 1 almost exclusively. Some ligands form also binuclear adducts (CH_3Hg) $_2\text{L}$ 2- λ and sulfide even forms (CH_3Hg) $_3\text{S}$ -. The coordination behaviours of CH_3Hg^+ and H^+ however are very different concerning the selection of ligands, the former being a soft and the latter a hard acid in the sense of PEARSON. The entropy, ΔS , of the reaction: $\text{H}^+ + \text{L}^- \rightarrow \text{HL}$ is more positive by about 14 e.u. than ΔS of the reaction: $\text{CH}_3\text{Hg}^+ + \text{L}^- \rightarrow \text{CH}_3\text{HgL}$. The hydrogen ion in aqueous solution has a far greater order producing action on the solvent than CH_3Hg^+ . Two dyes also have been investigated, which may serve as indicators for CH_3Hg^+ and for the determination of pCH_3Hg^+ ($-\log (\text{CH}_3\text{Hg}^+)$). (Novotny-Vanderbilt)
W71-09772

MERCURY IN THE AIR.

Committee for Environmental Information.
For primary bibliographic entry see Field 05B.
W71-09775

A COMPREHENSIVE STUDY OF SAN FRANCISCO BAY, California. University of Berkeley. Sanitary Engineering Research Lab. E. A. Pearson, P. N. Storrs, and R. E. Selleck. California State Water Resources Control Board Publication 42, 1971, p. 85, 8 fig., 17 tab., 24 ref. SERL Report No. 67-5.

Descriptors: *Bays, *Physical properties, *Chemical analysis, *Sampling, *Waste disposal, *Tidal effects, *Sedimentation, *Biology, *Fisheries, Water quality, Analytical techniques, Monitoring.
Identifiers: *San Francisco Bay, Interrelationships.

The State Water Quality Control Board conducted a comprehensive study of San Francisco Bay. The investigation was to determine existing water and sediment quality for quantitative inventory of waste discharges in the Bay, and to determine the effect or influence of significant waste discharges on the aquatic environment of the Bay. Included in the investigation were: physical, chemical and microbiological sampling and analytical methods; biological sampling and analytical methods; waste discharges and loadings; physical and hydrological characteristics; physical, chemical and biological water and sediment data; water and sediment quality

and waste discharge relationships and a model of mixing and diffusion. This report summarizes the entire investigation with conclusions and recommendations. (Ensign-PAI)
W71-09790

EFFECTS OF PULP MILL EFFLUENT ON WATER QUALITY AND BIOTA TRACE ELEMENT CHARACTERISTICS, Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 05C.
W71-09793

A CONSTANT GEOMETRY APPROACH TO IN SITU SEABED GAMMA MONITORING, Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab. E. Reynolds. *Health Physics*, Vol. 20, No. 3, p. 241-251, March 1971, 11 fig., 2 tab., 14 ref.

Descriptors: *Monitoring, *Waste disposal, *Radioactive waste disposal, Methodology, Technology, Application equipment, Design criteria.
Identifiers: *Irish Sea, *In-situ monitoring, *Constant Geometry approach, Seabed gamma probe.

An in situ seabed gamma monitoring device is described and its application theory explained. Essential design requirements of any in situ seabed gamma monitor include constant detector-to-sample geometry, adequate sensitivity and reliable performance, portability, and spectrometric facilities. Experimental results obtained in the Irish Sea are compared with results from seabed samples analysed in the laboratory. The efficacy of the method for the rapid assessment of the intensity of the seabed gamma field arising from radioactive waste disposal is indicated by the correlation between the two sets of data. (Ensign-PAI)
W71-09798

PARTICULATE Pb, Pb 210 AND Po 210 IN THE ENVIRONMENT, Batelle Memorial, Richland, Wash. Pacific Northwest Labs. J. C. Langford. *Health Physics*, Vol. 20, No. 3, p. 331-336, March 1971, 3 tab., 34 ref.

Descriptors: *Pacific Ocean, *Atlantic Ocean, *Lead radioisotopes, *Measurement, *Fallout, Water pollution sources, Pollutant identification.
Identifiers: *Polonium-210, *Particulate matter, Industrial wastes, Engine emissions.

Particulate Pb, ^{210}Pb and ^{210}Po were measured in the Pacific Ocean west of Newport, Oregon and in Atlantic Ocean between the Bahama Islands and Sierra Leone, Africa. In the Pacific Ocean specific activity of ^{210}Pb increased with depth due to the decreasing concentrations of stable Pb with depth. In the Atlantic Ocean the average particulate ^{210}Po concentration was 20% higher than the average ^{210}Pb concentration yet both isotopes were about one-tenth their radio-equilibrium concentrations from ^{226}Ra . The particulate stable Pb concentration in the Atlantic Ocean decreased ninefold. Pb concentrations are thought to be from vehicular and industrial sources transported to the marine environs by atmospheric processes. (Ensign-PAI)
W71-09799

NATIONAL MONITORING PROGRAM FOR THE ASSESSMENT OF PESTICIDE RESIDUES IN WATER, Geological Survey, Arlington, Va; and Environmental Protection Agency, Washington, D.C.; and Water Quality Office, Athens, Ga. H. R. Feltz, William T. Sayers, and H. P. Nicholson. *Pesticides Monitoring Journal*, Vol 5, No 1, p. 54-62, June 1971. 9 p., 1 fig., 1 tab., 23 ref.

Descriptors: *Monitoring, *Pesticide residues, *Sampling, Water supply, Surface waters, Groundwater, Rainfall, Surveys, Analytical techniques, Water analysis, Pollutant identification, Water pollution sources.
Identifiers: *Pesticide monitoring.

The proposed design of the program for monitoring pesticide residues in the hydrologic environment is a revision of the program initiated in 1967 by the Federal Water Pollution Control Administration and the U.S. Geological Survey and provides for a continuing assessment of the general levels of pesticides in the water and bottom sediments of the Nation's water courses. Water samples collected quarterly and bed material samples collected semiannually at 161 sites in the conterminous United States, Alaska, Hawaii, and Puerto Rico will be examined for the presence of pesticide residues. Sampling sites were chosen at random from hydrologic units within the major drainage basins defined by the Water Resources Council. Analyses will be performed using separation and identification techniques currently acceptable to the scientific community, and the data evaluation will be published in the *Pesticides Monitoring Journal*. (Knapp-USGS)
W71-09802

DETERMINATION OF TRACE QUANTITIES OF NITRILTRIACETIC ACID BY DIFFERENTIAL CATHODE-RAY POLAROGRAPHY, Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch. Badar K. Afghan, and Peter D. Goulden. *Environmental Science and Technology*, Vol 5, No 7, p. 601-606, July 1971. 6 p., 8 fig., 4 tab., 12 ref.

Descriptors: *Polarographic analysis, *Pollutant identification, *Detergents, *Chemical analysis, Chelation, Surfactants, Nitrogen compounds, Organic compounds.
Identifiers: *Nitrilotriacetic acid, NTA.

Two methods for the determination of nitrilotriacetic acid in natural water and detergents are proposed, depending upon the nature of the sample. Determination of 'free' NTA in natural water is based on the formation of a lead-NTA complex in alkaline medium at pH 8.0 using differential cathode-ray polarography. Determination of 'total' NTA is based on releasing NTA from metal complexes under acid conditions. The subsequent addition of EDTA and return of the sample to pH 8, preferentially bind the metals with EDTA. This frees NTA from metal complexes and the released NTA is then determined by lead-NTA method. The procedure for determination of NTA content in detergents utilizes bismuth-NTA reduction wave at pH 2.0. The method is capable of detecting as little NTA as 10 micrograms/liter without any preconcentration of the sample. (Knapp-USGS)
W71-09805

RADIOECOLOGICAL INVESTIGATION IN THE REGION OF MURUROA ATOLL (TUAMOTU ISLAND), Institute of the Biology of the Southern Seas, Sevastopol (USSR). A. N. Kolesnikova, G. V. Barinov, and A. Ya. Zesenko. Available from NTIS. Report AEC-tr-7024, p. 180-185 (*Radiobiologiya*, Vol. 9, No. 1, p. 139-143 (1969)). 3 fig., 3 tab., 4 ref.

Descriptors: *Radioactivity effects, *Crayfish, *Radioisotopes, *Plankton, Fallout, Pacific Ocean, Oceanography, Atolls, Gamma rays, Spectroscopy, Instrumentation.

Data are presented from the 20th voyage of the oceanographic ship Mikhail Lomonosov through former and present day atomic firing ranges. The gamma spectra of sample of zooplankton showed the presence of cerium-141 and -144, zirconium-95, niobium-95, and ruthenium-103 in concentra-

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification of Pollutants

tions from 0.16 to 12 pCi per kg of live weight. In the region of Mururoa Atoll, the French atomic firing range, anomalous crayfish were detected, the number of which was proportional to the radioactivity of the plankton. (Bopp-NSIC)
W71-09848

NATURAL AND ARTIFICIAL RADIONUCLIDES IN SEAFOODS AND MARINE PROTEIN CONCENTRATES, Oregon State Univ., Corvallis. Dept. of Oceanography.
Thomas M. Beasley, Charles L. Osterberg, and Yvonne M. Jones.
Nature, Vol 221, p 1207-9, 1969, 3 tab, 19 ref.

Descriptors: *Food chains, *Marine animals, *Radioisotopes, *Analytical technique, Instrumentation, Absorption, Lead radioisotopes, Cobalt radioisotopes, Radium radioisotopes, Human population.
Identifiers: Cesium radioisotopes, Manganese radioisotopes, Thorium radioisotopes, Polonium radioisotopes.

Radionuclide concentrations in seafoods were far below a hazardous level, but continued use of marine protein concentrates could result in the polonium-210, lead-210 pair becoming the principal source of the skeletal dose. Ra-226, Th-228, and the gamma-emitting radionuclides, Co-60, Mn-54, and Cs-137 were determined by gamma counting using multidimensional gamma spectrometry; Po-210 and Pb-210 by oxidation of organic matter in HClO₄-HNO₃ and deposition Po-210 on pure silver, and separation of Pb-210 from the plating matrix. (Bopp-NSIC)
W71-09849

RESEARCH ON THE MARINE FOOD CHAIN, PROGRESS REPORT, JULY 1969-JUNE 1970, PART III, California Univ., San Diego-La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 05C.
W71-09859

STUDY OF THE DISTRIBUTION OF RUTHENIUM IN AN ECOLOGICAL POND USING NEUTRON ACTIVATION ANALYSIS, (In French), Centre d'Etude de l'Energie Nucleaire, Grenoble (France). Laboratoire de Biologie Vegetale.
For primary bibliographic entry see Field 05B.
W71-09864

5B. Sources of Pollution

IMPLICATIONS OF CROP-PRODUCTION TECHNOLOGY FOR ENVIRONMENTAL QUALITY, Illinois Univ., Urbana. Dept. of Agronomy.
S. R. Aldrich, W. R. Oschwald, and J. B. Fehrenbacher.
Environmental Geology Notes, Illinois State Geological Survey, No 46, p 7-24, May 1971. 8 fig, 6 tab, ref.

Descriptors: *Agriculture, *Environment, *Farm wastes, *Crop production, Farm management.
Identifiers: *Crop-production technology, Environmental quality.

Illinois is used as a model to examine some effects of technology on the environment. The effects of selected modern crop production technologies are examined, including the use of nitrogen and phosphorus as fertilizers. Recent restrictions on the use of certain production technologies and attacks on fertilizer use have led to analysis in greater detail of the possibilities for an consequences of producing crops with less use of available technology. Return to more primitive agricultural methods, however, is regarded as unwise. The justification

for using each practice and subsystem of production must be challenged to insure the least undesirable impact on the environment. The utilization of the best available crop-production technology will likely meet the needs of society with the least harm to the environment. (Wray-Chicago)
W71-09476

RADIATION SURVEILLANCE NETWORK. Division of Operational Safety (AEC), Washington, D.C.
For primary bibliographic entry see Field 05A.
W71-09489

SURVEY OF ENVIRONMENTAL RADIOACTIVITY FOR PERIOD JANUARY 1, 1969 TO JUNE 30, 1969, Iowa State Univ. of Science and Technology, Ames.
M. D. Voss.
Availability: NTIS. Ames Laboratory, IS-2154, Aug 1969. 20 p.

Descriptors: *Environment, *Environmental effects, *Sampling, *Water, *Air, *Sedimentation, Water pollution, Nuclear reactors, Research equipment, Effluents, Fallout, Precipitation (Atmospheric).

The environmental program consists of air samples, soil, vegetation, river water, bottom sediment, precipitation, pond water, ALRR outfall, and well water samples. The ALRR reached full power as of 7/12/65. The data indicate that the ALRR has not contributed a significant amount of radioactivity to the environment in the Ames area. (Houser-NSIC)
W71-09496

RADIOLOGICAL STATUS OF THE GROUNDWATER BENEATH THE HANFORD PROJECT, JANUARY-JUNE, 1968, Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
T. H. Essig.
Availability: NTIS, US Department of Commerce, Springfield, Virginia, (\$3.00 per copy; \$0.95 microfiche). Battelle-Northwest BNWL-984, Jan 6, 1969. 20 p, 2 fig, 6 tab, 5 ref.

Descriptors: *Groundwater, *Groundwater movement, *Water pollution, *Water pollution control, *Water pollution effects, *Water pollution sources, Effluents, Soil water movement, Sediments, Radioactive well logging, Radioactivity effects.

More than 500 wells have been drilled to groundwater on the Hanford project for surveillance of radionuclide movement through sediments both above and below the regional water table. This report provides an evaluation of the status of groundwater contamination resulting from disposal of plant effluents. Total beta concentrations in the unconfined and confined groundwater aquifers are presented. Results are tabulated for well-water samples in which total beta concentrations exceeded the analytical limit. The average concentrations for the previous report period are listed for comparison. (Houser-NSIC)
W71-09497

BETA RADIOACTIVITY IN ENVIRONMENTAL AIR AND PRECIPITATION AT LOS ALAMOS, NEW MEXICO, FOR 1969, Los Alamos Scientific Lab., N. Mex.
W. R. Kennedy, and J. W. Aeby.
Availability: NTIS. LA-4388, Jan 1970. 10 p, 3 fig.

Descriptors: *Environment, *Air pollution, *Precipitation (Atmospheric), Sampling, Water, Water pollution, Water pollution sources, Fallout, Nuclear explosions.
Identifiers: Beta activity, Concentration, Los Alamos, New Mexico nuclear detonations, Testing.

Beta activity of particulate matter in both air and precipitation for 1969 are reported for Los Alamos, New Mexico. The gradually increasing levels in both air and water samples from January through July reflect a contribution from foreign fallout arriving at our station as well as greater than average rainfall. The slight upward trend in October is a normal seasonal upswing. (Houser-NSIC)
W71-09498

SURVEY OF ENVIRONMENTAL RADIOACTIVITY, Ames Lab., Iowa.
M. D. Voss.
Availability: NTIS. IS-2025, Jan 1969. 40 p.

Descriptors: *Environment, *Monitoring, *Pollutant identification, *Air pollution, *Water pollution, *Soil contamination, Water pollution sources, Surface waters, Rivers, Water holes, Ponds, Water wells, Sedimentation, Sampling, Analytical techniques, Nuclear reactors.
Identifiers: Gross alpha, Gross beta, Concentration, USAEC-Site, Ames laboratory, Research reactor.

The environmental radiation monitoring program of the American laboratory is described. The program consists of gross alpha and beta determinations of air, soil, vegetation, river water, Ames Laboratory Research Reactor (ALRR) outfall, bottom sediment, precipitation, well water, and pond samples. The data indicate that the ALRR has not contributed a significant amount of radioactivity to the environment in the Ames area. (Houser-NSIC)
W71-09499

RADIOLOGICAL STATUS OF THE GROUNDWATER BENEATH THE HANFORD PROJECT, JULY-DECEMBER 1969, Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
D. H. Benham.
Availability: NTIS. BNWL-1392, May 1970. 20 p, 3 fig, 5 tab, 5 ref.

Descriptors: *Groundwater, *Radioisotopes, *Tritium, *Ions, *Nitrates, Measurements, Evaluation, On-Site investigations, Water pollution, Soil contamination, Water pollution sources, Standards.
Identifiers: Ruthenium, Nitrate ions, Concentration, Hanford site.

Surveillance of the groundwater beneath the Hanford site is reported. The concentration of the ruthenium, tritium, and nitrate ions in the area groundwater is considered. These concentrations are evaluated in terms of their respective concentrations guides and to PHS drinking-water standard. (Houser-NSIC)
W71-09500

1966 ENVIRONMENTAL MONITORING RADIATION LEVELS AT BROOKHAVEN NATIONAL LABORATORY, Brookhaven National Lab., Upton, N.Y.
A. P. Hull, and J. T. Gilmartin.
Availability: NTIS. BNL-50196, Sep 1969. 32 p, 20 fig, 32 tab, 29 ref.

Descriptors: *Monitoring, *On-site data collections, *Sampling, *Nuclear reactors, *Measurement, *Background radiation, *Operations, Effluents, Gases, Particle shape, Particle size, Research facilities, Liquid wastes, Water pollution, Rivers, Radioisotopes.
Identifiers: Graphite research reactor, Particulates, Peconic River, High flux beam research reactor.

Measurements of natural background radiation levels and of increments attributable to laboratory operations obtained on site and in the vicinity of Brookhaven National Laboratory during 1966 are summarized. These increments include contributions from the gaseous and particulate effluents from the stack serving the Brookhaven Graphite

Research Reactor and the High Flux Beam Research Reactor, from multicurie field gamma sources, and from the discharge of low-level liquid wastes from the Laboratory's sanitary waste treatment plant into the headwaters of the Peconic River. (Houser-NSIC)
W71-09502

RADIOACTIVE WASTE DISCHARGES TO THE ENVIRONMENT FROM NUCLEAR POWER FACILITIES,

Bureau of Radiological Health, Rockville, Md. Div. of Environmental Radiation.
Joe E. Logsdon, and Robert I. Chissler.
Availability: NTIS PB-190 717. Bureau of Radiological Health, BRH/DER-70-2, March 1970. 76 p, 4 fig, 10 tab, 9 App.

Descriptors: *Nuclear power plants, *Liquid wastes, *Gases, *Nuclear waste, *Effluent, *Environment, Waste dilution, Waste disposal, Waste identification, Regulation management, Permits, Treatment facilities.

Data pertaining to discharges of radioactive liquid and gaseous wastes from nine selected operating nuclear power facilities are presented and discussed. Experience to date with nuclear power plants has shown that careful waste management practices, engineered safeguards, and proper operating procedures generally result in radioactivity levels in waste effluents of a few percent or less of the AEC's licensed discharge limits. Technical Specifications for all facilities limit liquid discharges such that average annual concentrations of radioactivity in the condenser cooling discharge canal will be less than values listed. Facility operating reports, which are prepared to demonstrate that the facility operator is in compliance with specific requirements of the operating license, vary widely as to units used and types of information concerning discharges of radioactive wastes. In general, there is a paucity of information in these reports concerning specific radionuclides discharged. A number of comparisons have been made of power produced versus liquid or gaseous waste discharges. The most predominant trends shown in these comparisons are that boiling water reactors discharge relatively large quantities of gaseous waste and pressurized water reactors discharge relatively high quantities of tritium in liquid wastes. Information is available concerning the type of waste treatment facilities installed at each nuclear power station. (Houser-NSIC)
W71-09503

COLUMBIA RIVER STUDIES, ANNUAL PROGRESS REPORT, 1969-1970,

Washington Univ., Seattle. Lab. of Radiation Ecology.
For primary bibliographic entry see Field 05C.
W71-09504

COLUMBIA RIVER STUDIES 1969-1970, UPTAKE OF Fe-55 BY MUSSELS FROM THE WASHINGTON COAST, 1962-1969,

Washington Univ., Seattle. Lab. of Radiation Ecology.
For primary bibliographic entry see Field 05C.
W71-09505

COLUMBIA RIVER STUDIES 1969-1970, ZINC BIOLOGICAL HALF-LIFE FOR OYSTERS IN A NATURAL ENVIRONMENT,

Washington Univ., Seattle. Lab. of Radiation Ecology.
For primary bibliographic entry see Field 05C.
W71-09506

COLUMBIA RIVER STUDIES 1969-1970, MONITORING OF MUSSELS FROM WASHINGTON WATERS FOR ZINC-65,

Washington Univ., Seattle. Lab. of Radiation Ecology.
For primary bibliographic entry see Field 05C.

W71-09507

COLUMBIA RIVER STUDIES 1969-1970, EFFECTS OF TEMPERATURE AND IONIZING RADIATION ON THE LARVAE OF THE PACIFIC OYSTER,

Washington Univ., Seattle. Lab. of Radiation Ecology.
For primary bibliographic entry see Field 05C.
W71-09508

COLUMBIA RIVER STUDIES 1969-1970, EFFECTS OF SHOCK TEMPERATURE AND IONIZING RADIATION ON PHYTOPLANKTON,

Washington Univ., Seattle. Lab. of Radiation Ecology.
For primary bibliographic entry see Field 05C.
W71-09509

EVALUATION OF RADIOLOGICAL CONDITIONS IN THE VICINITY OF HANFORD FOR 1967.

Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
For primary bibliographic entry see Field 05C.
W71-09510

A QUICK METHOD FOR THE RADIOCHEMICAL DETERMINATION OF CESIUM-137 IN WATER (IN GERMAN),

Staatliche Zentrale fuer Strahlenschutz, Berlin (East Germany).
For primary bibliographic entry see Field 05A.
W71-09511

RADIOLOGICAL STATUS OF THE GROUNDWATER BENEATH THE HANFORD PROJECT, JANUARY-JUNE 1969,

Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
D. H. Denham.
Availability: NTIS. BNWL-1233, Nov 1969. 20 p, 3 fig, 6 tab, 5 ref.

Descriptors: *Groundwater, *Radioisotopes, *Tritium, *Hydrogeology, *Ions, *Nitrates, Water, Wastes, Water pollution, Water pollution sources, Soil contamination, Water wells.

Groundwater surveillance data of beta, tritium, and nitrate ion concentrations in water around and beneath the Hanford plant were evaluated. (Houser-NSIC)
W71-09512

MEASUREMENTS OF BOMB-PRODUCED RADIOCARBON IN THE SURFACE AND SUBSURFACE WATERS OF THE PACIFIC OCEAN,

Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05A.
W71-09513

FINAL REPORT OF OFF-SITE SURVEILLANCE FOR PROJECT PALANQUIN.

Southwestern Radiological Health Lab., Las Vegas, Nev.

Availability: NTIS. PNE-910-F, May 1970. 128 p.

Descriptors: *Monitoring, *Nuclear explosions, *Testing, *Population, *Radioactivity, *Radioactivity effect, Environment, Sampling, Air pollution, Water pollution, Water pollution sources, Vegetation, Data collections, Public health, Hazards.
Identifiers: Concentration, Nevada test site, Off-site work, Surveillance program.

Off-site surveillance is reported in support of the Palanquin event conducted on April 14, 1965. Support consisted of tracking the effluent, monitoring radiation dosage to the off-site population, and col-

lecting environmental samples (air, milk, water, and vegetation). Analyses of radiological data indicate that radioactive effluent arising from this event did not present any health hazard to the off-site population, based on presently accepted safety criteria established by the USAEC. (Houser-NSIC)
W71-09514

RADIOACTIVITY IN WATER: PROJECT MILROW,

Isotopes, Inc., Palo Alto, Calif.
E. H. Essington, P. R. Fenske, and W. E. Nork.
Availability: NTIS. NVO-1229-135, March 1970. 45 p.

Descriptors: *Survey, *Explosions, *Explosives, *Radioactivity, *Water, *Radioactivity effect, *Radioecology, Ecosystem, Oceans, Aquatic environment, Effluents, Alaska, Islands, Hydrologic aspects, Seismic studies, Seismic waves, Faults (Geology), Surface drainage.
Identifiers: Surveillance program, Nuclear detonations, Peaceful uses, Amchitka.

Discusses post-milrow event conditions at Amchitka relative to explosion-produced radioactivity in water. Explosion effects which are related to modification of the hydrologic system are: (1) Formation of a rubble chimney and collapse sink, (2) formation of water spouts on the island and in the ocean during the seismic phase, (3) creation of lineations in the ocean possibly related to fault and fracture systems during the seismic phase, (4) formation of a long open fracture about 300 meters from ground zero that acted as a drain for surface water. (Houser-NSIC)
W71-09515

ENVIRONMENTAL RADIOACTIVITY - ISPRA (ITALY),

European Atomic Energy Community, Ispra (Italy).
M. de Bertoli, and P. Gaglione.
Availability: NTIS. EUR-4412, Sep 10, 1969. 60 p.

Descriptors: *Environment, *Radioactivity, *Measurements, *Fallout, *Water pollution, Strontium, Cesium, Pollutants, Air pollution, Soil contamination, Wastes, Foods.
Identifiers: Survey radiation, Concentration.

The measurements of environmental radioactivity performed during 1968 by the Site Survey Group of the Protection Service are briefly described. Data are given on the concentrations of Strontium-90, Cesium-137, and other radionuclides in fallout, air, soil, waters, herbage, animal bones, and foods. (Houser-NSIC)
W71-09516

ASPECTS OF THE RELEASE OF RADIOACTIVE MATERIALS FROM NUCLEAR INSTALLATIONS INTO THE ENVIRONMENT AND THE CONSEQUENCES FOR THE DISPOSAL OF RADIOACTIVE SEWAGE. (IN GERMAN),

Staatliche Zentrale fuer Strahlenschutz, Berlin (East Germany).
W. Rohnsch.
Availability: USAEC Depository Libraries in the U.S. and Overseas. SZS-16/69, Dec 1969. 21 p, 1 tab, 8 ref.

Descriptors: *Environment, *Effluents, *Nuclear power plants, *Nuclear wastes, *Population, *Regulation, Standards, Surface waters, Radiation, Rivers, Oceans, Radioactivity effects, Water pollution sources.
Identifiers: Baltic Sea, Maximum permissible burden, Germany.

The importance of the environmental capacity for the release of radioactive materials from nuclear installations is pointed out. Its dependence on natural characteristics and the utilization of the environment as well as on the maximum permissible radiation burden of the inhabitants is discussed,

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources of Pollution

especially for surface waters. From the basic principle of radiation protection the request for a well-founded minimum exploitation of the environmental capacity is derived. An estimation of the capacity of the surface waters of the G.D.R. and the Baltic Sea shows that for a long time the disposal of low-level radioactive wastes is possible when all the possible means of the water processing facilities are applied and permanently improved. (Houser-NSIC)
W71-09518

RADIOACTIVE CONTAMINATIONS OF THE AREA AND THE ENVIRONMENT OF THE INSTITUTE OF NUCLEAR RESEARCH ZERAN CENTER IN 1968 YEAR (IN POLISH), Institute of Nuclear Research, Warsaw (Poland). Z. Gorberg, and J. Jaskulski.
Availability: NTIS. INR-1117, 1970. 17 p.

Descriptors: *On-site investigations, *Environment, *Radioactivity, *Radioecology, Fallout, Soil contamination, Vegetation, Water, Surface waters, Water pollution, Water pollution sources.
Identifiers: Corn, Grass, Concentration, Comparisons.

The investigation results of the radioactive contaminations of the area and environment of Institute of Nuclear Research-Centre Zeran in the year 1968 are represented. The radioactivity of the fallout, soil, grass, corn, waters and liquid wastes as the most representative materials of the Centre area and environment were investigated. For comparison, the average radioactive contaminations of those materials in the previous years are given. (Houser-NSIC)
W71-09519

LOW-LEVEL RADIOACTIVE WASTE TREATMENT - THE WATER RECYCLE PROCESS, Oak Ridge National Lab., Tenn. W. C. Yee, F. Delora, and W. E. Shockley.
Availability: NTIS. ORNL-4472, July 1970. 30 p.

Descriptors: *Waste water treatment, *Radioactive wastes, *Water quality, *Water reuse, Environment, Ion exchange, Water conservation, Water purification, Water quality act, Waste disposal.
Identifiers: Water recycling, Pilot plant, Waste disposal liquid.

The water recycle process was developed for decontaminating low-level radioactive aqueous wastes and recycling the purified water for reuse at nuclear installations. This process was successfully demonstrated through several cycles in a micropilot plant, using ORNL waste that contained low concentrations of salts and radionuclides. The recycle of water should be an improvement over present methods in which the wastes are decontaminated and the purified water is discharged to the environment. (Houser-NSIC)
W71-09522

RADIOACTIVITY TRANSPORT IN WATER-MATHEMATICAL SIMULATION, Texas Univ., Austin. Allen White, and Earnest F. Gloyna.
Availability: NTIS. ORO-19, EHE-70-04, CRWR-52, 1970. 40 p. AEC Contract AT-(11-1)-490.

Descriptors: *Radioactive wastes, *Ion transport, *Diffusion, *Mathematical model, *Dispersion, Discharge lines, Waste treatment, Sedimentation, Sorption, Absorption, Water pollution treatment.

A mathematical model has been developed for routing a radionuclide through a model river system. The capabilities include the following characteristics: (1) it distributes radionuclide activity by advective and dispersal mechanisms along the longitudinal axis of the system, (2) it may be discretized into any number of segments (vertical planes normal to the longitudinal axis) as may be appropriate to describe spatial variations in

radionuclide activity, (3) it is capable of treating instantaneous, continuous, or time-varying releases of radionuclide activity, (4) it provides for a temporal description of radionuclide activity throughout the system, and (5) it provides for sorption and desorption by both plants and bottom sediments. (Houser-NSIC)
W71-09523

REPORT TO THE CONTRA COSTA COUNTY WATER AGENCY ON A STUDY OF THE EFFECTS OF THE PROPOSED FEDERAL SAN LUIS INTERCEPTOR DRAIN AND THE STATE SAN JOAQUIN VALLEY MASTER DRAIN. Metcalf and Eddy, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 06G.
W71-09577

HYDRAULIC TESTING OF THE OJO ALAMO SANDSTONE IN HOLE GB-3, PROJECT GASBUGGY, RIO ARriba COUNTY, NEW MEXICO, Geological Survey, Denver, Colo. J. E. Weir, Jr.
Available from National Technical Information Service, Springfield, Va. - Price \$3.00 printed copy; 95 cents microfiche. Geological Survey Open-file Report, USGS-474-91 (AEC), 1971. 26 p, 5 fig, 6 tab, 2 ref.

Descriptors: *Aquifer characteristics, *Groundwater movement, *Water pollution sources, *Nuclear explosions, *New Mexico, Bore holes, Fractures (Geology), Water level fluctuations, Permeability, Sandstones, Aquifers, Transmissivity, Radioactivity, Water analysis, Testing, Test procedures, Analytical techniques, Natural gas, Hydrologic data, Data collections, Geology, Hydrogeology, Water temperature, Groundwater, Chemical analysis, Water pollution sources, Radiochemical analysis, Path of pollutants.
Identifiers: *Aquifer evaluation, *Rio Arriba County (N Mex), Swabbing tests.

Hydraulic tests were made August 24 to September 2, 1969, in the Ojo Alamo Sandstone of Cretaceous age in hole GB-3, drilled about 20 months after the Gasbuggy explosion. The tests were made to determine whether increase in fracture permeability occurred as a result of the Gasbuggy experiment to stimulate gas production from a low yield reservoir by a nuclear explosion. The lower part of the formation, 3,564 to 3,686 feet below ground level, had a transmissivity (T) of 1.56 gallons per day per foot. Comparing this value with the value for T (2.64 gallons per day per foot), determined before the explosion for virtually the same stratigraphic interval in hole GB-1 in February 1967, suggests either that the Gasbuggy experiment fractured none of the lower Ojo Alamo Sandstone at hole GB-3 or that fracturing was insufficient to manifest itself through a permeability increase. A water sample from hole GB-3, as compared to a sample collected prior to the explosion from the same interval in hole BG-1, indicates a slight increase in radioactivity following the Gasbuggy experiment. (Woodard-USGS)
W71-09599

IMPROVEMENTS IN THE FINITE DIFFERENCE SOLUTION OF TWO-DIMENSIONAL DISPERSION PROBLEMS, Guelph Univ. (Ontario). D. W. Lawson.
Supported by National Research Council of Canada. Water Resources Research, Vol 7, No 3, p 721-725, Jun 1971. 5 p, 1 fig, 2 tab, 6 ref.

Descriptors: *Dispersion, *Numerical analysis, Computer programs, Diffusion, Mixing, Groundwater movement, Seepage, Porous media, Equations, Mathematical models.
Identifiers: *Finite difference method.

Two modifications of Shamir and Harleman's two-equation scheme for the finite difference solution

of two-dimensional dispersion problems are presented. These modifications improve both the accuracy and the efficiency of the solution. Shamir and Harleman's one-equation scheme is more efficient than the improved two-equation schemes, but it is not as accurate. (Knapp-USGS)
W71-09611

CHLORINATED HYDROCARBON INSECTICIDE CONTAMINATION OF STREAMBED SEDIMENTS IN THE MISSISSIPPI RIVER DELTA, Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 05G.
W71-09630

DISTRIBUTION AND FORMS OF MERCURY IN GROUND-AND SURFACE WATERS IN A REGION OF MOLYBDENUM DEPOSITS (Russian: O rasprostranennosti i formakh nakhozhdeniya rtuti v gruntovykh i poverkhnostnykh vodakh v rayone molibdenovykh mestorozhdeniy), Akademiya Nauk SSSR, Novosibirsk. Institut Geologii i Geofiziki. L. A. Nepeina, and V. I. Sotnikov.
Akademiya Nauk SSSR. Sibirskoye Otdeleniye. Geologiya i Geofizika, No 12, p 121-125, December 1970. 5 p, 2 tab, 6 ref.

Descriptors: *Water chemistry, *Groundwater, *Surface waters, *Molybdenum, *Heavy metals, Salts, Connate water, Organic matter, Geochemistry.
Identifiers: *USSR, *Mercury, Transbaykal, Chita Oblast, Gorno-Altaysk Autonomous Region, Molybdenite, Mineralization, Country rock.

The content of mercury in ground- and surface waters of two molybdenum deposits in Eastern Transbaykal and in the Amazar River valley (Chita Oblast) and Sary-Dzhaz River basin (Kirghiz SSR) is more or less constant, varying between 1.8 and 5.6 millionths of a g/liter. Mercury in the water samples was determined in three forms: by total mercury content, by mercury precipitated by hydrogen sulfide, and by mercury bound in stable mercury organic compounds, which was most stable to long distance migration. The predominant form of mercury for all samples was Hg (OH)₂. The mercury content in the waters examined was similar to that in the ground- and interstitial waters of the Aktash mercury deposit in the Gorno-Altaysk Autonomous Region. (Josefson-USGS)
W71-09644

BIOGEOCHEMICAL DISPERSION HALOS OF TIN IN A MONSOON CLIMATE OF THE SOUTHERN PART OF THE SOVIET FAR EAST (Russian: Biogeokhimicheskiye oreoly rassseyaniya olova v usloviyakh mussonnogo klimata yuga Dal'nego Vostoka), Khabarovskii Kompleksnyi Nauchno-Issledovatel'skii Institut (USSR). V. V. Bardyuk, and P. V. Ivashov.
Akademiya Nauk SSSR. Sibirskoye Otdeleniye. Geologiya i Geofizika, No 12, p 125-132, December 1970. 8 p, 5 fig, 2 tab, 20 ref.

Descriptors: *Plants, *Soils, *Water chemistry, *Soil-water-plant relationships, Metals, Geochemistry, Biochemistry, Surface waters, Groundwater, Connate water, Aqueous solutions.
Identifiers: *USSR, *Maritime Territory, *Tin, *Dispersion halos, Silver, Lead, Ore bodies, Geobotany, Ash content.

Studies were conducted at several tin deposits in the coniferous forests of the Sikhote Alin and Myao-Chan range, using the biogeochemical method of prospecting to determine and explain tin distribution in plants and soils. Despite its extremely weak mobility in the supergene zone, tin produces true dispersion halos in plants growing above ore bodies in all of the landscape zones and does not form biogeochemical anomalies outside

the zones of mineralization. A tin content of 0.001% in the surface waters of an ore field and a tin content of 0.03-0.06% in the waters of an ore zone attest to the migration of tin in aqueous solutions. The tin concentration in the ash content of plants above an ore zone is 10-300 times that in non-ore areas. Tin and most other metals, including lead, copper and silver, are accumulated in soils in the lower part of the profile below 30-40 cm. A very weak relationship (0.1) exists between the tin content of soils and plants; a closer relationship (0.37) is observed for lead. The biogeochemical method precludes the possibility of 'false' biogeochemical anomalies of tin and provides for sharply contrasting anomalies, a large number of accumulator plants and simplified plant sampling. (Josefson-USGS)
W71-09645

PHYSICAL (HYDRAULIC) MODELING OF HEAT DISPERSION IN LARGE LAKES: A REVIEW OF THE STATE OF THE ART, Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab. Edward Silberman, and Heinz Stefan. Available from National Technical Inf Service, Springfield, Va 22151 - Price \$3.00 (printed copy); \$0.95 (microfiche). Argonne National Laboratory Center for Environmental Studies Report ANL/ES-2, August 17, 1970. 110 p, 18 fig, 8 tab, 102 ref. Subcontract 31-109-38-2404 Argonne Nat Lab.

Descriptors: *Reviews, *Hydraulic models, *Bibliographies, *Dispersion, *Heated water, Thermal pollution, Thermal powerplants, Model studies, Path of pollutants, Mathematical models, Jets, Lakes.
Identifiers: Thermal plumes, Heat dispersion.

A survey was made of the state of knowledge of heat dispersion from steam generating plants into large lakes. The prospects and problems associated with physical or hydraulic modeling of thermal plumes and heat dispersion are reviewed. The studies reviewed include: physical concepts of thermal plumes derived from fundamental experimental studies and criteria for hydraulic modeling of dispersion; adaptability of hydraulic models to providing parameters for and checking of mathematical models; and case histories of hydraulic models applied to predicting thermal plumes at actual power plants. The materials reviewed include both published and unpublished literature, as well as direct interviews, mostly by long-distance telephone. (Knapp-USGS)
W71-09651

PESTICIDES IN WATER, Federal Water Pollution Control Administration, Corvallis, Oregon. Pacific Northwest Water Lab. Richard B. Marston, Robert M. Tyo, and Stephen C. Middendorf. Pesticides Monitoring Journal, Vol 2, No 4, p 167-171, March 1969. 4 fig, 2 tab, 2 ref.

Descriptors: *Endrin, *Application methods, *Water pollution sources, *Watershed management, *Drainage, *Runoff, Seed treatment, Pesticide residues, Pesticide drift, Agricultural chemicals, Hazards, Forest management, Watersheds (Basins), Clear-cutting, Oregon.
Identifiers: Pesticide runoff, Salado (Oregon).

A 175 acre 'clear-cut' watershed in the headwaters of the Alsea River near Salado, Oregon was reseeded on January 23, 1967, by the conventional practice of aerially broadcasting endrin-coated Douglas Fir seed. Measurable amounts of endrin were detected in streamflow for 2 hrs after seeding started and again during the high flow of a winter freshet that occurred the sixth day after seeding. The total amount of endrin found in these two periods of runoff amounted to 0.006 lb/square mile, or 0.12% of the endrin used to treat the seed. This was much lower than the results obtained in the laboratory (11.3%) from soaking endrin-treated seed in distilled water for 32 days. (LeGore-Washington)

W71-09667

ON THE SIGNIFICANCE OF METAL COMPLEXING AGENTS IN SECONDARY SEWAGE EFFLUENTS, Michigan Univ., Ann Arbor. Dept. of Environmental Health. Michael E. Bender, Wayne R. Matson, and Robert A. Jordan. Environmental Science and Technology, Vol 4, No 6, p 520-521, June 1970. 1 fig, 1 tab, 11 ref. FWPCA Grant 1-FI-WP-26-294-01, NIH Grant 5-501-FR-05447-07.

Descriptors: *Water pollution effects, *Organic wastes, *Eutrophication, *Chelation, *Sewage, *Organic compounds, Water pollution treatment, Water pollution sources, Environmental sanitation, Secondary treatment, Aquatic algae, Primary productivity, Trace elements, Phosphates, Nitrates, Laboratory tests.
Identifiers: *Chelators, Anodic stripping, Organic chelators.

Several components of secondary sewage other than phosphorous and nitrogen could be abetting lake eutrophication. The chelation of metals by organic compounds has been demonstrated to cause significant increases in algal production. This study was an attempt to find such chelators in secondary sewage effluents. Two distinct metal-complexing molecular weight fractions were demonstrated using recent advances in anodic stripping techniques. One fraction has a molecular weight similar to that of synthetic chelators and has proven effective in stimulating algal growth. Subsequent investigations are attempting to rule out the possibility that other substances in sewage fractions could be responsible for the apparent stimulation. (LeGore-Washington)
W71-09674

PRELIMINARY REPORT ON THE BENTHIC FAUNA OF THE RIVER TESHIO (In Japanese), Mitsuaki Atoda, Kiyoshi Yoshizumi, Teruhiko Awakura, Toshitake Asano, and Tomiko Ito. English summary. Scientific Reports of the Hokkaido Fish Hatchery, No 24, p 97-114, Dec 1969. 1 fig, 1 tab, 8 ref.

Descriptors: *Ecotypes, *Streambeds, *Benthic fauna, Speciation, Varieties, Stream erosion, Running waters, Aquatic animals, Insects, Midges, Stoneflies, Caddisflies, Mayflies, Oligochaetes, Resistance, Physiological ecology, Environmental effects.
Identifiers: *Stream fauna, Species diversity, Japan, Leeches, Earthworms, Gammarus sp, Teshio River Japan, Diversity.

The benthic fauna at eleven stations on the Teshio River, Japan, and at fourteen stations on twelve of its tributaries was examined. The upper Teshio River's benthos was diverse, and consisted largely of relatively sensitive organisms. From Nayoro City downstream, the species diversity decreased and a progressively larger proportion of the organisms were of 'tolerant' species. Six tributaries had 'good' bottom conditions and held diverse populations, but the other six tributaries contained poorly diversified faunal collections. The predominant bottom gravels and sands were considered the major influences on the poor species diversity in the lower Teshio River. (LeGore-Washington)
W71-09676

TOXICITY AND TREATMENT OF DE-INKING WASTES CONTAINING DETERGENTS, International Pacific Salmon Fisheries Commission, New Westminster (British Columbia). For primary bibliographic entry see Field 05C.
W71-09678

CAN GROUNDWATER POLLUTION BE AVOIDED, Missouri Geological Survey, Rolla. J. H. Williams.

Groundwater, Vol 7, No 2, p 21-23, March-April 1969.

Descriptors: *Water pollution, *Groundwater, *Missouri drilling, Water pollution control, Water pollution effects, Water pollution sources.
Identifiers: Missouri generalized geology.

Pollution of groundwater to the point of crisis in Missouri can be eliminated by an awareness of geology, by planning, by adequate funding, and by authority to follow planning. Groundwater pollution hazards are widespread in southern Missouri where permeable soils'nd cavernous bedrock exist. Pollution in northern Missouri is more localized. All of the pollution in Missouri that we have attributed to geologic features could have been avoided if the polluters - municipal and private had obtained adequate geologic information, used common sense, and supported waste disposal plans with adequate financing. (Campbell-NWWA)
W71-09729

POLLUTION, PESTICIDES AND THE PEOPLE - AGRICULTURE AND OUR NATURAL ENVIRONMENT. Greater Des Moines Chamber of Commerce, Iowa. Agricultural Dept. For primary bibliographic entry see Field 05C.
W71-09752

PESTICIDES, Environmental Protection Agency, Washington, D.C. Pesticide Advisory Committee. For primary bibliographic entry see Field 05C.
W71-09758

SEDIMENT: EVERYBODY'S POLLUTION PROBLEM, Soil Conservation Service, Washington, D.C. Kenneth E. Grant. In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 67-76, 1 tab, 8 ref.

Descriptors: *Sediment, Water pollution effects, *Sedimentation, Agriculture, Soil erosion, Right-of-way, Soil, Farm waste, Water quality, Watersheds, Flood damage, Value, Benefits, Soil surveys, Research and development, Land management.
Identifiers: Nonfarm sources, Soil Conservation Service, Soil capability, Universal Soil Loss Equation, Wind Erosion Equation, Mulch tillage, Conservation Needs Inventory.

Sediment is the nation's largest pollutant. It is not only a pollutant in itself, but a carrier of animal wastes and chemical pollutants. Examples of the enormity of the sediment problem are cited. Non-farm sources of sediment are a serious and growing problem. The fight against soil erosion has been headed by more than 3000 local soil and water conservation districts in the United States. A Conservation Needs Inventory indicates that 63% of all privately owned land (cropland, pasture, range, forest, other) needs some type of conservation treatment. Examples of the effectiveness of conservation measures are given. Continuing research and cooperation is needed between agencies and the general public in the resource conservation area. (See also W71-09752) (White-Iowa State)
W71-09760

SURFACE TEMPERATURE GRADIENTS OBSERVED IN MARINE AREAS RECEIVING WARM WATER DISCHARGES, Bureau of Sport Fisheries and Wildlife, Tiburon, Calif. Tiburon Marine Lab. James L. Squire, Jr. Bureau of Sport Fisheries and Wildlife Technical Paper No. 11, January, 1967, 8 p., 6 fig., 2 tab., 6 ref.

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources of Pollution

Descriptors: *Thermal pollution, *Cooling water, Remote sensing, Outlets, Beaches, Fish, Water pollution sources.
Identifiers: Surface temperature, Coastal water.

Four outfall areas of steam electric generating plants in southern California were surveyed twice in early 1963. Equipment used for the survey was an infrared radiometer, a stripchart recorder, and associated power supply, mounted in a 4-place aircraft. During the first survey, the total cooling water output from the plants was 1,236 million gallons per minute heated 12.5F to 22F above intake temperatures at the plant sites. During the second survey, output was 1,187,400 gpm, heated 19F to 21F above intake temperatures. The four outfall areas surveyed were Redondo Beach, Alamitos, Huntington Beach and Carlsbad-Encina. Surface temperature increases above ambient on the two surveys were 4.2 and 4.0 for Redondo Beach, 17.0 and 20.0 for Alamitos, 7.2 and 6.5 for Huntington Beach and 8.0 and 4.0 for Carlsbad-Encina. Since observations were of surface gradients, the extent of mixing at depth was not determined. It is conceivable that large volumes discharge in the surf zone could impede the migration of such fish as drums (Scianidae) and surf perches (Embiotocidae). On the other hand, warm discharges are known to occasionally attract marine game species such as bonito (*Sarda chiliensis*) and barracuda (*Sphyraena argentea*). (Upadhyaya-Vanderbilt)
W71-09769

FOSSIL FUELS AS A SOURCE OF MERCURY POLLUTION,
Miami Univ., Fla. Rosenstiel School of Marine and Atmospheric Sciences.
Oiva I. Joensuu.
Science, Vol. 172, June 4, 1971, p. 1027-1028, 1 tab., 11 ref.

Descriptors: Environment, Leaching, Fungicides, Water pollution sources.
Identifiers: Mercury pollution, *Fossil fuels, *Mercury.

The buildup of mercury in the biomass is a recent phenomenon. A large part of the mercury found in the environment is apparently derived from industrially produced mercury, (about 10,000 tons per year) most of which is eventually discarded in waste streams. Amounts used as fungicides in treatment of grain seeds are much too small to explain high mercury contents in wildlife except in grain eating birds. To obtain an estimate of amount of mercury in coal, 36 American coals were analyzed by means of a mercury vapor detector. The average of the results (3.3 ppm) cannot be applied to total coal production. Applying a conservative estimate of 1 ppm, it is concluded that 3000 tons of mercury per year is released from the yearly production of 2 billion tons of coal. An upper limit of 230 tons per year for leached mercury by weathering is obtained by comparison with corresponding figures for sodium. (Upadhyaya-Vanderbilt)
W71-09770

THE COMPLEX CHEMISTRY OF METHYL-MERCURY CATIONS (IN GERMAN),
Eidgenössische Technische Hochschule, Zurich (Switzerland). Lab. of Inorganic Chemistry.
For primary bibliographic entry see Field 05A.
W71-09772

MERCURY IN THE AIR.
Committee for Environmental Information.

Environment, Vol. 13, No. 4, p. 24-33, May, 1971, 4 fig., 1 table, 9 ref.

Descriptors: *Heavy metals, *Air pollution, *Pollutant identification, *On-site tests, Incineration, Powerplants, Industrial plants, Spectrometers, Water pollution sources.
Identifiers: *Mercury, *Air emissions, *Concentration levels, *Annual output, Mercury vapors.

A recent airborne survey conducted by the Committee for Environmental Information revealed that the annual mercury vapor discharge from some coal burning powerplants, municipal incinerators and several industrial plants may range from 100-5400 pounds per year at individual sites. The estimated annual rate of mercury vapor discharge from only 12 locations in Missouri and Illinois exceeds the rate of mercury discharge into waterways by the nation's 50 major mercury polluters. Measurements were made with the Barringer Airborne Mercury Spectrometer, from a helicopter. Obtained concentration ranges and estimated rates of output from some 15 powerplants, 4 incinerators and 8 industrial plants are compiled, followed by a brief discussion of possible sources of mercury. It is pointed out that the study was made in winter, when vapor readings would be lowest. (Oleszkiewicz-Vanderbilt)
W71-09775

MERCURY IN THE ENVIRONMENT,
Terri Aaronson.
Environment, Vol. 13, No. 4, p. 16-23, 4 fig.

Descriptors: *Heavy metals, *Public health, *Environmental effects, *Food chains, Air pollution, Water pollution sources, Industrial plants, Standards, Jurisdiction, Circulation, Path of pollutants, Human diseases, Agricultural chemicals, Foods, Toxicity.
Identifiers: *Mercury, *Methyl mercury, *Maximum Permissible Level, Intake levels, Emissions, Symposium summary.

A resume of the symposium on 'Mercury in Man's Environment' held by the Royal Society of Canada in Ottawa on February 15 and 16 is presented. Various topics have been discussed during that meeting, among others: (1) present and past sources of mercury in the environment agriculture accounts for about 4% of the total mercury consumed annually in the USA; thermometers broken in homes and hospitals in Canada annually release to the environment 14,000 pounds of elemental mercury; (2) levels of mercury contamination - food chains; (3) biological and medical aspects of mercury pollution, and (4) maximum permissible levels of mercury contamination of food-stuffs. The author concludes that despite the hundred-year history of mercury pollution, its sources are only now being traced. Power plants, incinerators, chemical plants, and perhaps hospitals and laboratories, are major modern sources of the 23 million pounds of mercury released worldwide each year. (Oleszkiewicz-Vanderbilt)
W71-09776

TWO LAYER STRATIFIED FLOW IN CONVERGING SECTION,
Water Economics Research Inst., Warsaw (Poland).
W. Poplawski.
In Polish with English summary. Archiwum Hydrotechniki, Vol. XVII, No. 3, p. 365-378, 1970, 8 fig., 7 ref.

Descriptors: *Laboratory tests, *Mixing, *Stratified flow, *Hydraulic models, *Froude number, *Density stratification, *Mathematical models, Fluid friction, Velocity, Distribution pattern, Outlet works, Hydraulic conduits, Heated water, Waste water disposal.
Identifiers: *Densimetric Froude number, *Fluid motion equations, Bresse's equation, TVA Engineering Laboratory.

Laboratory studies are presented on determination of the minimum densimetric Froude number, necessary to enforce complete mixing of wastewater introduced to river with a density different from that of the ambient fluid. The studies, conducted at the TVA Engineering Laboratory at Norris, resulted in the following conclusions: (1) The construction of an approximate mathematical model on the basis of a set of fluid motion equations probably yields better results than attempts at purely empirical correlations. (2) Rapid mixing

cannot be expected in rivers where the densimetric Froude number (F') is equal to 1.0. Outlet construction should create sufficient velocity of discharge that the minimum $F' - 5$ be obtained and in the case of deep rivers this number should be even higher. (Oleszkiewicz-Vanderbilt)
W71-09777

MERCURY IN MAN,
Washington Univ., Seattle. School of Medicine.
For primary bibliographic entry see Field 05C.
W71-09778

NOTE: FORMATION OF METHYL MERCURY FROM PURE MERCURIC SULPHITE IN AEROBIC ORGANIC SEDIMENT,
Swedish Water and Air Pollution Lab., Stockholm (Sweden).
Torbjorn Fagerstrom, and Arne Jernelov.
Water Research, Pergamon Press, Vol. 5, No. 3, p. 121-122, 1971, 3 ref.

Descriptors: *Heavy metals, *Sediments, *Aerobic methylation, Laboratory tests, Toxicity, Aquaria, Water pollution control.
Identifiers: *Methyl mercury formation, *Biological methylation, *Mercuric sulphide, Mercury.

The formation of methyl mercury in aerobic organic sediments has been studied. It has been shown in the laboratory that even the form of pure mercuric sulphite is available for biological methylation. The speed of the methylation process, however, is considerably lower than when mercury is present as inorganic divalent mercury. The amount of methyl mercury formed from added mercuric sulphide corresponds to the amount formed from inorganic divalent mercury at a concentration of .0010 of that for mercuric sulphide. (Oleszkiewicz-Vanderbilt)
W71-09779

PRACTICAL REMOTE SENSING, THE USE OF A THERMAL MAPPER IN STUDIES OF COOLING WATER DISCHARGES FROM OPERATING THERMAL POWER PLANTS,
Pacific Gas and Electric Co., Emeryville, Calif.
For primary bibliographic entry see Field 07B.
W71-09780

THERMAL DISCHARGES: CHARACTERISTICS AND CHEMICAL TREATMENT OF NATURAL WATERS USED IN POWER PLANTS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05D.
W71-09782

MERCURY IN THE ENVIRONMENT,
L. J. Goldwater.
Scientific American, Vol. 224, No. 5, p. 15-21, May, 1971, 8 fig.

Descriptors: *Heavy metals, *Toxicity, *Public health, Environmental effects, Food chains, Industrial production, Circulation, Epidemiology, Water pollution, Air pollution, Solid wastes, Chromosomes.
Identifiers: *Mercury, *Methyl mercury, Mercury demand, Mercury industry, Cinnabar deposits, Aquatic life, Lithosphere, Biosphere.

Review of the present state of affairs regarding mercury in the environment suggests that the best way to deal with the problem is to apply the techniques of epidemiology, preventive medicine, public health and industrial hygiene that have been effective in meeting hazards in the past. A system should be set up for frequent monitoring of the environment for the detection of significant increases in mercury contamination. Distribution of various forms of mercury is presented followed by the discussion of the mercury cycle in the lithosphere, hydrosphere, atmosphere and biosphere, as well as

conversion of the metal into methyl mercury in the aquatic food chain and in the sediments. Industries responsible for direct and indirect discharge of mercury into the environment are outlined. Atmospheric mercury levels measured at San Francisco (including some above 0.02 micrograms/cubic meter) and concentration levels found in food are presented; some biological effects of ingestion are also discussed. A need is noted for a better understanding of what should be considered a toxic level of mercury in the human body. (Oleszkiewicz-Vanderbilt)
W71-09787

A WATER RESOURCE-WATER SUPPLY STUDY OF THE POTOMAC ESTUARY,
Environmental Protection Agency, Annapolis, Md. Chesapeake Technical Support Lab.

Norbert A. Jaworski, Leo J. Clark, and Kenneth D. Feigner.
Environmental Protection Agency, Water Quality Office, Technical Report 35, April 1971, 263 p, 39 tab.

Descriptors: *Estuaries, *Water quality, *Water resources development, *Water supply, Waste water, Runoff, Dissolved oxygen, Algae, Nutrients, Bacteria, Viruses, Heavy metals, Human population, Waste water treatment, Water quality control.
Identifiers: Potomac Estuary.

A detailed investigation of the water quality and water resources of the Potomac Estuary was conducted by the Chesapeake Technical Support Laboratory. Included in the study were an evaluation of pollution sources including nutrients; the development of mathematical models to predict pollutant effects on water quality; the projection of water supply needs and wastewater loadings; an evaluation as a potential water supply source; the determination of the maximum pound loadings by zone for certain pollutants under different flow conditions; alternative waste treatment plans and cost analysis of wastewater treatment. (Ensign-PAI)
W71-09788

UTILITY OF RADIOISOTOPE METHODOLOGY IN ESTUARY POLLUTION CONTROL STUDIES. PART I. EVALUATION OF THE USE OF RADIOISOTOPES AND FLUORESCENT DYES FOR DETERMINING LONGITUDINAL DISPERSION COEFFICIENT IN ESTUARIES.

Quirk, Lawler and Matusky Engineers, New York.

Available from the Clearinghouse for Federal, Scientific and Technical Information, Bureau of Standards, U.S. Dept. of Commerce, Springfield, Virginia, \$3.06. Atomic Energy Commission Report NYO 39611, August 1969, 197 p, 44 fig, 27 tab, 73 ref.

Descriptors: *Estuaries, *Water pollution control, *Radioisotopes, *Fluorescence, *Dye releases, *Dispersion, Tracers, On-site investigations.

The relative merits of using radiotracers and fluorescent dyes for determining longitudinal dispersion coefficients in estuaries were evaluated. Areas where radiotracers would provide a feasible means of estimating the mass transport parameter were delineated. Evaluation of more than 100 radioisotopes and fluorescent dyes showed only eighteen suitable as field tracers. The eighteen tracers were compared on the basis of selected mathematical models. Analysis showed that there are advantages and limitations to both groups of tracers. Radiotracers seem to meet the technical requirements of an ideal tracer better than other materials. However, non-technical aspects such as approval and licensing by various governmental agencies, adverse public reaction, handling, safety and personnel can be problems. These aspects are important advantages of using dyes as field tracers. (Ensign-PAI)
W71-09791

MERCURY IN WASHINGTON STATE,
Washington State Dept. of Ecology, Olympia.

Ronald A. Lee.
Report of Mercury Sampling and Analysis, Spring 1970-Spring 1971, January, 1971, 22 p, 9 tab.

Descriptors: *Industrial wastes, *Municipal wastes, *Pollutants, *Distribution patterns, Sediments, Washington.
Identifiers: *Mercury, Chlorine-alkaline plant outfall.

From the spring of 1970 to the spring of 1971 mercury levels in Washington state waters and sediments from industrial and municipal waste waters were investigated. A listing of data collected to determine the occurrences and distribution of mercury in Washington, in accordance with state regulation and control of unnatural mercury discharges are contained in the results. (Ensign-PAI)
W71-09792

PARTICULATE Pb, Pb 210 AND Po 210 IN THE ENVIRONMENT,

Batelle Memorial, Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 05A.
W71-09799

NATIONAL MONITORING PROGRAM FOR THE ASSESSMENT OF PESTICIDE RESIDUES IN WATER,

Geological Survey, Arlington, Va; and Environmental Protection Agency, Washington, D.C.; and Water Quality Office, Athens, Ga.
For primary bibliographic entry see Field 05A.
W71-09802

RUNOFF OF DEICING SALT: EFFECT ON IRONDEQUOIT BAY, ROCHESTER, NEW YORK,
Rochester Univ., New York. Dept. of Geological Sciences.

Robert C. Bubeck, William H. Diment, Bruce L. Deck, Alton L. Baldwin, and Stewart D. Lipton. Science, Vol 172, No. 3988, p 1128-1132, June 11, 1971. 5 p, 4 fig, 13 ref. NSF Grant GA-11146, NOAA SEA Grant GH-106.

Descriptors: *Water pollution effects, *Salinity, *Lake Ontario, *New York, *Snow removal, Deicers, Melting, Salts, Chlorides, Density, Density stratification, Thermal stratification, Turnovers, Mixing.
Identifiers: *Irondequoit Bay (N.Y.).

Salt used for deicing the streets near Rochester, New York, has increased the chloride concentration in Irondequoit Bay at least fivefold during the past two decades. During the winter of 1969-70 the quantity and salinity of the dense runoff that accumulated on the bottom of the bay was sufficient to prevent complete vertical mixing of the bay during the spring. Comparison with 1939 conditions indicates that the period of summer stratification has been prolonged a month by the density gradient imposed by the salt runoff. (Knapp-USGS)
W71-09803

CONVOLUTION APPROACH TO THE SOLUTION FOR THE DISSOLVED OXYGEN BALANCE EQUATION IN A STREAM,
Geological Survey, Fort Collins, Colo.

James P. Bennett.
Water Resources Research, Vol 7, No 3, p 580-590, June 1971. 11p, 4 fig, 17 ref.

Descriptors: *Water pollution control, *Waste assimilative capacity, *Dissolved oxygen, *Biochemical oxygen demand, *Oxygen demand, Mathematical models, Water pollution effects, Path of pollutants, Oxygen sag, Numerical analysis, Self-purification.
Identifiers: *Oxygen balance (Streams).

In terms of its response to biochemical oxygen demand (BOD) and dissolved oxygen (DO) inputs, a natural waterway may be treated as a system governed by the BOD and DO balance differential equations. Using the response of the DO balance differential equation to impulse inputs of DO and BOD, one can compute by convolution the response of the system to arbitrary BOD and DO inputs. The convolution technique requires numerical integration, but it is not a numerical solution to a differential equation; it therefore avoids the stability problems inherent in such solutions. The convolution technique permits consideration of longitudinal dispersion in systems that have time varying DO and BOD inputs, a situation that could previously be investigated only by numerical solutions to the basic differential equations. Examples show the capability of the convolution technique to reproduce field data and to match previously developed analytical and numerical techniques. (Knapp-USGS)
W71-09820

UNSOLVED PROBLEMS OF AQUATIC RADIOECOLOGY,

Institute of Biology of the Southern Seas, Sevastopol (USSR).
G. G. Polikarpov.
Available from NTIS. Report AEC-tr-7171, p 121-136 (Radiobiologiya, Vol. 10, No. 2, p 242-252 (1970)) 10 fig, 2 tab, 32 ref.

Descriptors: *Radioecology, *Nuclear wastes, *Fallout, Aquatic life, Absorption, Radionuclides, Strontium radioisotopes, Water pollution effects.
Identifiers: Yttrium radioisotopes, Cerium radioisotopes, Cesium radioisotopes.

On the basis of an analysis of the present state of aquatic radioecology, the most important problems with respect to the protection of nature are discussed: (1) determination of the role of the physicochemical state of radionuclides in the radioecological concentration processes; and (2) disclosing the mechanisms of the penetration, accumulation, and distribution of radionuclides in living systems. (Bopp-NSIC)
W71-09847

RADIOACTIVITY CONTENTS IN SOME PLANKTON AND SEA WATER SAMPLES COLLECTED DURING THE PERIOD BETWEEN 1960 AND 1968,
Parma Univ. (Italy).

For primary bibliographic entry see Field 05C.
W71-09857

RADIOACTIVITY AND FALLOUT: THE MODEL POPULATION,
Brookhaven National Lab., Upton, N.Y.

For primary bibliographic entry see Field 05C.
W71-09860

RADIOACTIVITY TRANSPORT IN WATER: SUMMARY REPORT,

Texas Univ., Austin. Center for Research on Water Resources.
Yousef A. Yousef, Akira Kudo, and Earnest F. Gloyna.
Available from NTIS. ORO-490-20 (Feb. 1970). 80 p, 28 fig, 18 tab, 27 ref.

Descriptors: *Radioisotopes, *Mathematical models, *Ecosystems, Movement, *Path of pollutants, Persistence, Hydraulic transportation, Hydraulic properties, Sedimentation, Sediment transport, Absorption, Computer programs, Biomass, Water pollution sources.

A transport model is presented which describes the behavior of radionuclide movement in an ecosystem, and considers hydraulic transport, sediment sorption and desorption, and biomass uptake and release. Solutions of the transport model are programmed and verified using data obtained from

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the laboratory ecosystem and the research flume. The limitations and relative importance of environmental factors affecting transport are evaluated, and recommendations for the use of this prediction model are discussed. (Bopp-NSIC)
W71-09861

ENVIRONMENTAL RADIOACTIVITY, ISPRA 1969, European Atomic Energy Community, Ispra (Italy).
M. D. Burtoli, and P. Gaglione.
Availability: NTIS. Report EUR-4563e, 1970, 50 pages.

Descriptors: *Environment, *Monitoring, *Radioactivity, *Measurement precipitation (Atmospheric), Air pollution, Water pollution, Water pollution sources, Fallout, Vegetation, Food chains, Milk, Fish, Animals, Food and Cover Crops, Strontium radioisotopes, Cesium.
Identifiers: Surveillance Program, Concentration, Calcium, Radium.

Briefly described are the measurements of environmental radioactivity performed during 1969 by the site survey group of the protection service of the Euratom Ispra establishment. Data are given on the concentrations of Strontium-90, Cesium-137, and other radionuclides in precipitation, air, waters, herbage and foods. The origin of the contamination is mainly world-wide fallout. (Houser-NSIC)
W71-09862

INFLUENCE OF THE PHYSIOCHEMICAL FORM OF RUTHENIUM ON CONTAMINATION OF MARINE ORGANISMS, (In French), Departement de la Protection Sanitaire, Cherbourg (France). Section de Radio-ecologie.
Pierre Guegueniat, Pierre Bovard, and Jacques Ancellin.
Comptes Rendus, Series D, Vol 268, Feb 10, 1969, p 976-979.

Descriptors: *Marine animals, *Marine plants, Radioisotopes, Physicochemical properties, Anion adsorption, Colloids, Aquaria, Absorption, Water pollution effects, Cation exchange, Cation adsorption, Hydrolysis, Marine algae, Invertebrates, Nuclear wastes, Water pollution sources.
Identifiers: *Ruthenium radioisotopes.

The derivatives of ruthenium nitrosyls from effluents of fuel reprocessing plants were found in various physicochemical forms in sea water - as precipitates, in solution, or in colloidal form. The form in which the ruthenium was present depended upon the amounts of other suspended material in the sea water. Experiments in aquaria showed that ruthenium present in precipitates caused more contamination of marine algae and invertebrates as compared with soluble (cationic) ruthenium. (Bopp-NSIC)
W71-09863

STUDY OF THE DISTRIBUTION OF RUTHENIUM IN AN ECOLOGICAL POND USING NEUTRON ACTIVATION ANALYSIS, (In French), Centre d'Etude de l'Energie Nucleaire, Grenoble (France). Laboratoire de Biologie Vegetale.
M. Neuburger, and A. Fourcy.
International Journal of Applied Radiation and Isotopes, Vol 20, p 641-651 (1969). 9 fig, 7 tab, 7 ref.

Descriptors: *Lakes, *Neutron activation analysis, *Nuclear wastes, Aquatic plants, Amphibious plants, Lake soils, Sediments, Water pollution sources, Pollutant identification.
Identifiers: *Ruthenium radioisotopes.

Ruthenium is one of the components of radioactive wastes issued from nuclear experimentation. As ruthenium radioisotopes have the same biological behaviour as stable ruthenium, it is suggested to

study the partition of a low intake of non-radioactive ruthenium in an ecological pond which is initially nearly free of natural ruthenium. For this purpose, water, sediments, aquatic and semiaquatic plants are periodically taken off and analyzed according to an original technique, using neutron activation analysis. (Bopp-NSIC)
W71-09864

A SUMMARY OF WATER POLLUTION PROBLEMS IN THE LAKE MICHIGAN BASIN, Toltz, King, Duvall, Anderson and Associates, Inc., St. Paul, Minn.
Harry Cleveland Grounds.
In: Proceedings, Tenth Conference on Great Lakes Research, Ann Arbor, Braun-Brumfield, Inc., 1967, p 420-426.

Descriptors: *Water pollution sources, *Water quality, Water pollution control, Industrial wastes, Population, Government, Rivers, Watersheds, Basins, Costs, Financing, Sewerage, Waste treatment, Taxes.
Identifiers: *Lake Michigan, *Waste load, Pulp and paper industry, Pollution zones.

The water pollution problems in the Lake Michigan watershed zones are surveyed, including the waters of the Calumet region in Illinois and Indiana, the Green Bay area in Wisconsin and Michigan, and parts of the St. Joseph, Grand, Kalamazoo and Muskegon Rivers in Indiana and Michigan. The major source of pollution of these waters is the industrial wastes from industries supporting the watershed's 5.5 million population. These include pulp and paper manufacturers, petro-chemical processes, steel manufacture, and food processing. Wastes from these industries exceed the basin population in terms of population equivalents, boosting the waste load to approximately equal the raw wastes of some 6 million persons. The efficacy of various water pollution control agencies, enforcement agencies, and pollution measures is cited and indications are made that such agencies are working with local government and industry to improve present water quality and insure its protection for future use. (Murphy-Rutgers)
W71-09883

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THERMAL POLLUTION IN THE MARINE ENVIRONMENT, New York State Dept. of Conservation, Albany. Div. of Marine and Coastal Resources.
Albert C. Jensen.
The Conservationist, Vol 25, No 2, p 8-13, Oct-Nov 1970. 5 fig.

Descriptors: *Thermal pollution, Commercial fishing, Project planning, Ecology.
Identifiers: *New York State's Marine District, Hudson River, Long Island Sound.

If adequate ecological planning is not undertaken before the construction of a power plant, the damage to the fishing industry from thermal pollution can be substantial. Although, at the present time, eighty percent of New York State's Marine Districts thermal pollution comes from electric power plants, the plans for construction of massive nuclear power plants could have more serious consequences because they are planned for areas where the pollution level is still low. (Holmes-Rutgers)
W71-09480

STUDY OF TRITIUM HAZARDS, Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre D'Etudes Nucleaires.
B. Vaubert, and R. Bittel.
Availability: NTIS. CEA-BIB-182, EUR-4522F, Sep 1970. 47 p.

Descriptors: *Tritium, *Bibliographies, *Radiation, *Radioisotopes, *Hydrogen, Oxygen, *Water, *Gases, Chemical reactions, Hazards, Radiochemical analysis, Transfer, Environment, Meteoric water, Aquifers, Absorption, Biological communities, Inhalation, Environmental effects, Biological properties.

In this bibliography the following points were considered: nuclear characteristics, tritium production processes and resulting potential hazards; tritium behavior towards hydrogen and several hydrogenated compounds; detection and radiochemical determination; environmental transfers, with emphasis on tritium behavior in the presence of atmospheric water and in various aquifer systems; some biological considerations of absorption, inhalation, and dosimetry; and radiobiology in order to characterize effects caused by the nuclear characteristics of tritium. (Houser-NSIC)
W71-09493

ROLE OF FRESHWATER PLANTS IN THE COPRECIPITATION OF STRONTIUM-90 WITH CALCIUM CARBONATES (IN RUSSIAN), N. V. Kulikov, S. A. Lyubimova, and N. A. Timofeeva.
Ekologiya, No 4, p 55-8, 1970. 4 tab, 12 ref.

Descriptors: *Strontium radioisotopes, *Cyanophyta, *Chlorophyta, *Adsorption, Calcium carbonate, Chemical precipitation, Absorption, Surface.

Strontium-90 was present in a calcium carbonate precipitate on freshwater plant surfaces, both in aquariums and in natural habitats. About one order of magnitude more strontium was present in the precipitate than within plant tissues. The discrimination coefficient, (strontium-90/calcium in the precipitate)/(strontium-90/calcium in water), was independent of the calcium concentration in water and the value between different plants varied from 0.34 to 1.25. Formation of the precipitate probably occurs through a reaction of calcium and strontium chlorides with sodium carbonate which is induced by metabolic processes. (Bopp-ORNL)
W71-09501

COLUMBIA RIVER STUDIES, ANNUAL PROGRESS REPORT, 1969-1970, Washington Univ., Seattle. Lab. of Radiation Ecology.
Allyn Seymour.
Availability: NTIS. RLO-2225-T-1-2, Jun 22, 1970. 30 p, 2 app.

Descriptors: *Ecology, *Ecosystem, *Columbia River, *Temperature, *Radioactivity effects, *Oysters, *Mussels, *Phytoplankton, Absorption, Iron, Life cycles, Zinc, Environment, Monitoring.

Six research programs were completed or were in progress at the radiation ecology laboratory during the 1969 to 1970 reporting period. These include: effects of temperature and ionizing radiation on the larvae of the Pacific oyster; effects of shock temperature and ionizing radiation on phytoplankton; uptake of Fe-55 by mussels from the Washington coast (1962 to 1969); zinc biological half-life for oysters in a natural environment; dose measurements with thermoluminescent dosimeters; and monitoring of mussels from Washington waters for Zn-65. Results from each phase of the research programs are briefly discussed. (See also W71-09505 thru W71-09509) (Houser-NSIC)
W71-09504

COLUMBIA RIVER STUDIES 1969-1970, UPTAKE OF Fe-55 BY MUSSELS FROM THE WASHINGTON COAST, 1962-1969, Washington Univ., Seattle. Lab. of Radiation Ecology.
Allyn Seymour.
Availability: NTIS. RLO-2225-T-1-2, June 22, 1970, p 2-5.

Descriptors: *Ecology, *Ecosystems, *Absorption, *Aquatic life, *Biology, *Columbia River, *Mussels, *Fallout, *Radioactivity effects, Animals, Animal population, Iron, Life cycles.

Fe-55 in fallout and mussels are related. The pattern of Zn-65 in mussels is not unlike that in lichen and moss from northern Sweden for the years 1962-1966, although the actual values for mussels are about 1/10 the lichen and moss values. Mussels probably take up iron rapidly, but the biological half-life is greater than the physical half-life of Fe-55. (See also W71-09504) (Houser-NSIC) W71-09505

COLUMBIA RIVER STUDIES 1969-1970, ZINC BIOLOGICAL HALF-LIFE FOR OYSTERS IN A NATURAL ENVIRONMENT, Washington Univ., Seattle. Lab. of Radiation Ecology. Allyn Seymour. Availability: NTIS. RLO-2225-T1-2, June 22, 1970, p 5-9.

Descriptors: *Columbia River, *Ecology, *Ecosystems, *Absorption, *Oysters, *Zinc radioisotopes, Life-cycles, Biology, Environment, Environmental effects, Radioactivity effects.

The biological half-life for ZN-65 may be as short as 100 days for the summer months (perhaps for a spawning oyster) or as long as 1,350 days. Average values for 9 oysters for the first 15 months of the experiment were 158 days for effective half-life and 538 days for biological half-life. (See also W71-09504) (Houser-NSIC) W71-09506

COLUMBIA RIVER STUDIES 1969-1970, MONITORING OF MUSSELS FROM WASHINGTON WATERS FOR ZINC-65, Washington Univ., Seattle. Lab. of Radiation Ecology. Allyn Seymour. Availability: NTIS. RLO-2225-T-1-2, June 22, 1970, p 10-13.

Descriptors: *Nuclear power plants, *Zinc radioisotopes, *Mussels, *Columbia River, *Harbors, *Radioactivity effect, Monitoring, Sampling, Aquatic animals, Ecology, Water pollution, Water pollution effects, Water pollution sources.

The primary objective is to relate the output of Zn-65 from the Hanford reactors with the Zn-65 values in mussels from Washington waters. The samples were collected at the mouth of the Columbia River, along the ocean coast and the Straits of Juan de Fuca and in Puget Sound. A secondary objective is to relate the Zn-65 value in mussels with distance from the mouth of the Columbia River. Of the eight original production reactors at Hanford, seven have been shut down between January 1965 and February 1970. As a consequence, the amount of Zn-65 in mussels has decreased, with the most significant decrease occurring near the mouth of the Columbia River, where the concentration of Zn-65 is the greatest. (See also W71-09504) (Houser-NSIC) W71-09507

COLUMBIA RIVER STUDIES 1969-1970, EFFECTS OF TEMPERATURE AND IONIZING RADIATION ON THE LARVAE OF THE PACIFIC OYSTER, Washington Univ., Seattle. Lab. of Radiation Ecology. Allyn Seymour. Availability: NTIS. RLO-2225-T-1-2, June 22, 1970, p 1. App A.

Descriptors: *Columbia River, *Oysters, *Temperature, *Radioactivity effects, *Life cycles, *Ecosystems, *Tritium, *Zinc radioisotopes, Aquatic animals, Biology, Absorption, Water pollution, Thermal pollution, Water pollution effects, Water pollution sources.

The experiments showed that temperature effects occurred between 24C and 28C and that radiation effects occurred at H-3 and Zn-65 concentrations of 10.3 Ci/liter. However, no effects of the interaction between temperature and radiation were observed and, the life stage at time of irradiation was not a factor in producing abnormal larvae. A detailed discussion of these experiments is given. (See also W71-09504) (Houser-NSIC) W71-09508

COLUMBIA RIVER STUDIES 1969-1970, EFFECTS OF SHOCK TEMPERATURE AND IONIZING RADIATION ON PHYTOPLANKTON, Washington Univ., Seattle. Lab. of Radiation Ecology. Allyn Seymour. Availability: NTIS. RLO-2225-T-1-2, June 22, 1970, p 2, App B.

Descriptors: *Radioactivity effect, *Thermal pollution, *Water pollution, *Water pollution effect, Water pollution sources, *Phytoplankton, Aquatic fungi, Columbia River, Ecology, Ecosystem.

The objective was to determine the effects of short time temperature changes, of ionizing radiation, and of temperature changes plus ionizing radiation on phytoplankton organisms as measured by their ability to use carbon in the photosynthetic process. The experiments were designed to measure primary productivity in water used as the secondary coolant for nuclear reactors. Although the amount of radionuclides in the discharge water will be very small, the radiation phase of the experiment will be of academic interest. The temperature effects on primary production are of considerable ecological significance since primary production is the foundation for all higher trophic levels. (See also W71-09504) (Houser-NSIC) W71-09509

EVALUATION OF RADIOLOGICAL CONDITIONS IN THE VICINITY OF HANFORD FOR 1967, Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.

Availability: NTIS. BNWL-983, March 1969. 87 p, 30 fig, 11 tab, 17 ref, and BNWL-983 Feb 1969, (App.). 139 p.

Descriptors: *Waste water disposal, *Effluents, *Water pollution sources, *Waste water (Pollution), Water pollution control, Monitoring, Environment, Sedimentation, Columbia River, Population, Diets.

Controlled releases of a variety of low-level radioactive wastes are made to the Columbia River, to the ground, and to the atmosphere. The major source of low-level wastes released to the environment in 1967 continued to be reactor cooling water discharged to the Columbia River. Evaluation of the combined offsite effects of all radioactive waste releases during 1967 showed that concentrations of radionuclides in the environs and radiation doses received by nearby population groups were well within accepted limits. Estimates were made of the whole body, gastrointestinal tract, and thyroid doses and the annual intake of bone-seeking nuclides. Population groups considered included Maximum Individuals and typical Richland residents, and for the first time Richland residents. Diet information accumulated from plant employees permitted calculation of both average dose values and dose distribution for Richland residents. The only population dose estimate exceeding one-tenth of the appropriate limit was 12% of the Maximum Permissible Rate of Intake to the bone of a hypothetical Maximum Individual, with P-32 contributing 99% of the estimated dose and Columbia River fish the major source of intake. (Houser-NSIC) W71-09510

PHOSPHATE MEASUREMENTS IN NATURAL WATERS, A CRITIQUE, Minnesota Univ., Minneapolis. Limnological Research Center. For primary bibliographic entry see Field 05A. W71-09557

IMPOUNDMENT EFFECTS ON WATER QUALITY AS REFLECTED IN PARASITISM OF RESERVOIR BASSES, Arkansas Univ., Fayetteville. Water Resources Research Center. David A. Becker. Available from the National Technical Information Service as PB-200 826, \$3.00 in paper copy, \$0.95 in microfiche. Technical Completion Report, Water Resources Research Center, 1971, 10 p, 13 ref. OWRR Project A-009-ARK (5).

Descriptors: *Fish parasites, *Bass, Pre-impoundment, Early impoundment, Dispersion, Fluctuation, Aging, Growth rates, Sport fish, Water pollution effects, *Impoundments, Fish, *Parasitism. Identifiers: Black bass, Helminth parasites, Copepod parasites.

Field investigations involved live collections of the black basses *Micropterus dolomieu* Lacepede, *M. punctulatus* (Rafinesque), and *M. salmoides* (Lacepede). Bases were examined in the laboratory for helminth and copepod parasites in an effort to follow the quantitative and qualitative dispersions and fluctuations of these parasites as the water quality is effected by the water level fluctuations from a river to a reservoir environment. Standard and total length, weight, and scale samples were obtained to ascertain the effect of parasitism on the aging and growth rates of basses which may help explain why sport fishing declines after several years in recently impounded reservoirs effecting the recreational economy of the municipalities surrounding reservoirs. Parasitism were related to the whole food chain in an attempt to establish another parameter for water quality. The comparison of pre- and post-impoundment data was stressed. Results were also compared with other studies involving newly impounded reservoirs. (Babcock-Arkansas) W71-09559

PHYTOPLANKTON DYNAMICS AND PRODUCTIVITY IN A SHALLOW, HIGHLY EUTROPHIC LAKE: WITH SPECIAL REFERENCE TO MELOSIRA AMBIGUA (GRUN.) O. MULL. AND M. GRANULATA (EHR.) RALFS, Wisconsin Univ., Madison. Water Resources Center. William E. Sloey. Doctor of Philosophy Thesis, Dept of Botany, University of Wisconsin-Milwaukee, 1969, 162 p, 22 fig, 6 tab, 126 ref. OWRR Project A-011-WIS (2).

Descriptors: *Phytoplankton, *Diatoms, *Turbulence, *Aquatic plants, *Water temperature, *Dissolved oxygen, *Dissolved solids, *Lake, *Water chemistry, Wisconsin, *Eutrophication. Identifiers: *Population dynamics, *Melosira granulata (Ehr) Ralfs, *M. ambigua (Grun) O Mull, Thermal stability, Secchi disc transparencies, Nitrate variation, Phosphate variation, Carbon-14 productivity, *Stephanodiscus niagarae* Ehr, *S. Hantzschii* Grun, *Anabaena*, *Microcystis*, *Aphanizomenon*.

The phytoplankton population dynamics, carbon-14 primary productivity and certain physico-chemical properties of the shallow and highly eutrophic Lake Butte des Morts, Wisconsin was studied in 1966-69. Two co-dominant summer diatoms, *Melosira granulata* (Ehr.) Ralfs and *M. ambigua* (Grun.) O. Mull., widely recognized as indicators of eutrophy, were emphasized in the study. Periodicities of other planktonic members of the genus *Melosira* have been shown to be related primarily to water turbulence, and perennation is

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due to survival as vegetative cells in the bottom sediments during periods of thermal stability. Lake Butte des Morts is a portion of the larger Winnebago pool and has an area of 37.79 square kilometers, a mean depth of 1.42 meters, and a theoretical retention time of only 2 to 14 days. The trophic state of the lake is comparable to western Lake Erie and the lake is presently undergoing a significant loss of aquatic macrophytes and turbidity is increasing. Thermal stability was found to be temporary during open water periods and occurred only during calm conditions. The water quality characteristics of the lake were evaluated in terms of water temperature, dissolved oxygen, Secchi disc transparencies, dissolved solids, nitrate, and phosphate variation during seasonal changes. Both *Melosira ambigua* and *M. granulata* were found alive in the bottom sediments to depths of 7 centimeters, while few other forms survived at any depth. Temperature is the dominant factor apparently regulating population growth rates of these two species and data from the study and from the literature were collected to characterize these species.

W71-09561

FALL CHINOOK SALMONS SPAWNING IN THE COLUMBIA RIVER NEAR HANFORD, 1947-1969,

Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.

D. G. Watson.

Available from the National Technical Information Service as BNWL-1515, \$3.00 in paper copy, \$0.95 in microfiche. Battelle Northwest Laboratories report BNWL-1515, Oct 1970. 45 p.

Descriptors: *Thermal pollution, *Fish behavior, *Chinook salmon, *Ecosystems, Columbia river. Identifiers: *Heated effluents, *Osteichthyes.

There was no evident relationship between the operation of the Hanford reactors and the numbers of fish spawning in the Hanford reach of the river. Recent increases in numbers of fall chinook spawners seemed more closely associated with the construction of dams downstream and immediately upstream from Hanford, and the probable displacement of fish from these areas. Water temperatures were less than 15°C during the peak of spawning, well within the upper tolerance limits for this species.

W71-09573

TEMPERATURE, TIMING, AND SEAWARD MIGRATION OF JUVENILE CHINOOK SALMON FROM THE CENTRAL COLUMBIA RIVER,

Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.

C. D. Becker.

Available from the National Technical Information Service as BNWL-1472, \$3.00 in paper copy, \$0.95 in microfiche. Battelle Northwest Laboratories report BNWL-1472, Jul 1970. 21 p.

Descriptors: *Thermal pollution, *Fish behavior, *Chinook salmon, Columbia River. Identifiers: *Hanford production reactors, *Heated effluents, *Osteichthyes.

A sizeable population of adult chinook salmon now spawns each fall in the free-flowing Hanford environs of the central Columbia River. This population has acquired significance because other vital spawning areas in the mainstem Columbia have been inundated by hydroelectric development. Studies conducted in 1969 show that the progeny of the Hanford population migrates seaward from April to July in the ancient pattern that correlates with favorable water temperatures and high discharge volumes. In contrast, the passage of juvenile chinooks that now issue from upriver reaches is known to be delayed until July and August when temperatures and discharge volumes are less favorable. Temperatures in the central Columbia are modified by discharges of heated ef-

fluent from plutonium production reactors at Hanford, in addition to largely seasonal changes in river flow, cooling or warming by the upriver reservoir complex, and summer heat input from the atmosphere. In 1968 and 1969, mean weekly water temperatures peaked in late July, August, and early September with maximum daily temperatures briefly reaching 19.1 and 19.7°C, respectively, at Priest Rapids and 19.7 and 20.6°C at Richland. The relationship of ambient temperatures and river discharges to the natural and delayed migration of juvenile chinooks through the Hanford area is evaluated. Maximum temperatures in the central Columbia seldom exceed 22°C and have not been recorded as approaching 25.1°C, the apparent upper incipient lethal limit for juvenile chinooks. Although peak summer temperatures (above 20°C) may be suboptimum for the survival of young salmon, such conditions probably existed long before the advent of modern man. Present peak temperatures do not appear to be directly lethal even with increments of heat from reactor effluent. Potentially adverse thermal effects from reactor operation would most likely appear at subacute levels and resist casual detection. This assumes that a slight increase in excess of the annual temperature cycle does not greatly intensify other existing environmental hazards.

W71-09574

THE ROLE OF PRIMARY PRODUCTION IN SOLVING PROBLEMS OF HYDROBIOLOGICAL PROCESSES AND THE MEANS OF CONTROLLING THEM,

Naval Oceanographic Office, Washington, D.C.

V. I. Zhadin.

Available from the National Technical Information Service as AD-720 183, \$3.00 in paper copy, \$0.95 in microfiche. Naval Oceanographic Office Translation 199, 1963; trans-from: Pervichnaya Produktsiya morey i vnutrennikh rod.

Descriptors: *Water pollution, *Plankton, *Fouling, Sanitary engineering. Identifiers: Biological contamination, Hydraulic systems, USSR, *Primary biological productivity.

The paper discusses the effect of primary production and biological contamination of water basins, which causes pollution of water and fouling on vessels, water pipes and hydraulic structures. The problems arising from the phenomena and the measures aimed at lessening or eliminating their negative effect on national economy and sanitary conditions are singled out, indicating the need for special organizations and institutes that would contribute to the solution of the complex problems.

W71-09575

COMPREHENSIVE WATERSHED MANAGEMENT-THE ANADROMOUS FISHERY RESOURCE,

Contra Costa Coll., San Pablo, Calif. Dept. of Biology.

For primary bibliographic entry see Field 06G.

W71-09583

EFFECTS OF TURBIDITY ON FOREST RECREATION POTENTIALS,

Forest Service (USDA), Jackson, Miss.

For primary bibliographic entry see Field 05G.

W71-09631

PHYSIOLOGICAL ECOLOGY OF SELECTED POLYCHAETOUS ANNELIDS EXPOSED TO DIFFERENT TEMPERATURE, SALINITY AND DISSOLVED OXYGEN COMBINATIONS,

Maine Univ., Orono.

Thomas L. Richards.

Ph.D. Thesis, August 1969, 170 p, 42 fig, 21 tab, 176 ref. NSF Grant GB-4892 and Office of Water Resources Research Project No A-011 ME (2).

Descriptors: *Annelids, *Physiological ecology, *Water temperature, *Salinity, *Dissolved oxygen,

*Biochemical oxygen demand, Worms, Environmental effects, Thermal pollution, Sea water, Salt tolerance, Stress, Effective stress, Invertebrates, Resistance. Identifiers: *Polychaetes, Nereidae, Spionidae, Survival.

Survival of adult and larval polychaetes belonging to the families Nereidae and Spionidae in reduced dissolved oxygen concentrations was temperature and salinity dependent, and independent of the life history stages. Species adapted to estuarine conditions tolerate wide fluctuations in temperature, salinity and dissolved oxygen, while species found in open coast areas, where environmental changes are not so great, survived only moderate changes. Nereids and spionids would make good assay organisms. (Katz-Washington) W71-09658

TEMPERATURE TOLERANCE OF YOUNG-OF-THE-YEAR CISCO, COREGONUS ARTEDI, II,

National Marine Fisheries Service, Ann Arbor, Mich. Great Lakes Fishery Lab.

Thomas A. Edsall, and Peter J. Colby.

Transactions of the American Fisheries Society, Vol 99, No 3, p 526-531, July 1970. 4 fig, 1 tab, 14 ref.

Descriptors: *Water temperature, *Lethal limit, *Physiological ecology, *Cold resistance, *Heat resistance, *Cisco, *Environmental effects, Bioassay, Temperature, Fish physiology, Aquatic environment, Water quality, Water pollution effects, Fish diseases, Great Lakes, Growth stages.

Identifiers: *Coregonid fishes, Coregonidae, Natural mortality.

Young-of-the-year ciscoes (*Coregonus artedii*) acclimated to 2.5, 10, 20 and 25°C and tested for tolerance to high and low temperatures provide the first detailed description of the thermal tolerance for coregonids in North America. The upper ultimate lethal temperature of the young ciscoes was 26°C (6°C higher than the maximum sustained temperature tolerated at adult ciscoes in nature) and the ultimate lower lethal temperature approached 0°C (near that commonly tolerated in nature by adult ciscoes). The temperature of 26°C is slightly higher than the lowest ultimate upper lethal temperature recorded for North America freshwater fishes; however, published information on the depth distributions of fishes in the Great Lakes suggests that some of the other coregonids may be less tolerant of high temperatures than the ciscoes. (LeGore-Washington) W71-09659

THE TOXICITY OF THE HYDROLYSIS AND BREAKDOWN PRODUCTS OF MALATHION TO THE FATHEAD MINNOW (PIMEPHALES PROMELAS, RAFINESQUE),

Michigan Univ., Ann Arbor. Dept. of Environmental Health.

Michael E. Bender.

Water Research, Vol 3, p 571-582, 1969. 4 fig, 2 tab, 14 ref. USPHS grant no ES-00016-02.

Descriptors: *Toxicity, *Organophosphorous pesticides, *Lethal limit, *Pesticide kinetics, *Pesticide residues, *Pesticide toxicity, Bioassay, Control, Toxins, Hydrolysis, Hydrogen ion concentration. Identifiers: *Malathion, *Breakdown products, *Synergism, TLm, Pimephales sp.

Malathion undergoes hydrolysis in aqueous solutions; the products derived from the reaction are dependent upon the pH of the medium. It was the purpose of this investigation to evaluate the toxicity of the products of malathion hydrolysis in the fathead minnow, *Pimephales promelas*. The studies were conducted by toxicity bioassays of 96 hr duration and continuous exposure tests of 14 day duration. The results of the experiments demonstrated the following: (1) the basic hydrolysis product, diethyl fumarate, was more toxic than malathion to the test species; (2) a pronounced synergistic effect

was demonstrated between malathion and its two basic hydrolysis products; and (3) continuous exposure decreased the TLM concentration of malathion and its basic hydrolysis products. (LeGore-Washington)
W71-09661

ECHINODERMS: AN AUTORADIOGRAPHIC STUDY OF ASSIMILATION OF DISSOLVED ORGANIC MOLECULES,
Newcastle-upon-Tyne Univ. (England). Dept. of Zoology; and Newcastle-upon-Tyne Univ. (England). Dove Marine Lab.
A. R. Fontaine, and Fu-Shiang Chia.
Science, Vol 161, p 1153-1155, Sept 13, 1968. 2 tab, 8 ref.

Descriptors: *Absorption, *Physiological ecology, *Animal physiology, *Metabolism, *Organic compounds, Penetration, Aquatic animals, Biochemistry, Analytical techniques.
Identifiers: *Assimilation, *Echinodermata, Autoradiography, Cucumaria sp., Amphipholis sp., Sea cucumber, Starfish.

Autoradiographic techniques were utilized to examine assimilation of dissolved organic molecules by a holothurian (*Cucumaria lactea*) and an ophiroid (*Amphipholis squamata*). Animals were immersed in experimental solutions for 3 hr and sampled at 0, 1, 3 and 7 days post-exposure. Labelled glycine and glucose remaining in the autoradiographs was apparently incorporated into synthesized macromolecules. Cells differ in their competence to metabolize specific nutrients, an indication that there are specialized cellular responses to exogenous organic molecules. Embryonic ophiroid tissues have an exceptional capacity for assimilation. (LeGore-Washington)
W71-09662

ECOLOGICAL MANAGEMENT PROBLEMS CAUSED BY HEATED WASTE WATER DISCHARGE INTO THE AQUATIC ENVIRONMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
John Cairns, Jr.
Water Resources Bulletin, Vol 6, No 6, p 868-878, November-December 1970, 4 fig, 22 ref.

Descriptors: *Water pollution effects, *Water pollution sources, *Water pollution treatment, *Water pollution control, *Cooling water, *Heated water, *Water temperature, *Electric powerplants, Environmental effects, Water quality, Aquatic environment, Temperature, Aquatic populations, Physiological ecology, Technology, Nuclear powerplants, Thermal powerplants, Stress.
Identifiers: *Thermal pollution, Energy production, Energy utilization, Biological stress.

Discharge of heated waste water may affect entire aquatic ecosystems and, if the temperature change is large, may destroy the capacity of the ecosystem to serve a variety of beneficial purposes. However, it is possible to discharge heated waste water in carefully controlled amounts without seriously degrading the aquatic ecosystem. There are four basic alternatives open to us regarding heated waste water: (1) placing all heated waste water in streams, lakes and oceans without regard to the effects, thus considering the environmental damage a necessary consequence of our increased power demand; (2) using, but not abusing, existing ecosystems; (3) finding alternative ways to dissipate or beneficially use waste heat; and (4) modifying ecosystems to fit the new temperature conditions. We have reached a stage of development in which the ecological portion of our life-support system is endangered by the expanding industrial portion. Optimal function and full beneficial use of both portions will be possible only if a variety of disciplines and diverse points of view can cooperate. Since wastes in amounts that are acceptable taken one at a time may be lethal collectively, environmental management should be on a regional basis. (LeGore-Washington)

W71-09664

PESTICIDE RESIDUES IN FISH ARE STAGGERING, HOWEVER, DDT CAN BE REMOVED FROM FISH.

Environmental Science and Technology, Vol 3, No 7, p 613, July 1969.

Descriptors: *DDT, *Chlorinated hydrocarbon pesticides, *Pesticide removal, Pesticide residues, Public health, Pesticide kinetics, Delaware River, Fish.
Identifiers: Fish flesh, Fish contamination, Cooking, Food preparation, Pesticide occurrence.

A two year monitoring program conducted by the Bureau of Sport Fisheries and Wildlife found chlorinated hydrocarbon residues in fish from 45 U.S. rivers and lakes. The highest DDT concentration, 45.27 ppm, was found in white perch from the Delaware River. Up to 55% of the DDT in fish flesh can be removed by deep frying, 36% by broiling, 25% by pan-frying and 11% by baking. (LeGore-Washington)
W71-09665

INORGANIC COMPOSITION OF GALLBLADDER BILE FROM FASTED RAINBOW TROUT,
Bureau of Sport Fisheries and Wildlife, LaCrosse, Wis. Fish Control Lab.
Joseph B. Hunn.
The Progressive Fish Culturist, Vol 31, No 4, p 221-222, October 1969. 1 tab, 9 ref.

Descriptors: *Fish physiology, *Ions, *Biochemistry, *Salts, Rainbow trout, Inorganic compounds, Calcium, Magnesium, Phosphorous, Sodium.
Identifiers: *Starved fish, Fasting, Starving, Salmo sp, Bile, Chloride.

Fasting fish are subject to an obligatory loss of salt by way of urine. These salts can be replaced by ion uptake across the gills and for a limited period from the intestine, but bile has been given little study as a source of intestinal salts. Rainbow trout (*Salmo gairdneri*) were fasted for 96 hr before samples were taken. Gallbladder bile from these fish contained concentrations of sodium, potassium, calcium and magnesium that exceeded those of the plasma. Concentrations of chloride and inorganic phosphate were less than those in the plasma. Bile may make significant contributions of Na, K, Ca and Mn to the intestinal tract, thereby influencing enzymatic activity and osmoregulation. (LeGore-Washington)
W71-09666

PESTICIDES IN WATER,
Federal Water Pollution Control Administration, Corvallis, Oregon. Pacific Northwest Water Lab.
For primary bibliographic entry see Field 05B.
W71-09667

OXIDATIVE METABOLISM OF ROTENONE IN MAMMALS, FISH, AND INSECTS AND ITS RELATION TO SELECTIVE TOXICITY,
Institute of Physical and Chemical Research, Tokyo (Japan). Lab. of Insect Toxicology.
Jun-ichi Fukami, Takashi Shishido, Kazuo Fukunaga, and John E. Casida.
Agricultural and Food Chemistry, Vol 17, No 6, p 1217-1226, Nov-Dec 1969. 3 fig, 5 tab, 35 ref.

Descriptors: *Rotenone, *Toxicity, *Fish physiology, *Animal physiology, *Metabolism, Pesticides, Piscicides, Pathology, Inhibitors, Biochemistry, Respiration.
Identifiers: *Toxicity mechanism, *Mechanism of toxicity, *Selective toxicity, *Detoxification, *Liver function.

Rotenone inhibits the respiration of mitochondria by blocking the reduced nicotinamide adenine dinucleotide (NADH) - dehydrogenase segment of

the respiratory chain. It appears that rotenone's selective toxicity, i.e. moderate toxicity to mammals vs. extreme toxicity to fish and insects, depends upon differences in the distribution pattern or in the detoxification rate of rotenone in various organisms. The results of described in vivo and in vitro studies on rotenone detoxification indicate that the effects of components in the soluble fraction of liver homogenates possible are related to the selective toxicity of rotenone to mammals, fish and insects. (LeGore-Washington)
W71-09668

EFFECT OF ETHANOL, BOURBON AND VARIOUS ETHANOL LEVELS ON Y-MAZE LEARNING IN THE GOLDFISH,
Boston City Hospital, Mass. Alcohol Study Unit; and Harvard Medical School, Boston, Mass.
Ralph S. Ryback.
Psychopharmacologia (Berl), Vol 14, p 305-314, 1969. 5 tab, 17 ref. National Inst of Mental Health Grant No 09245.

Descriptors: *Alcohols, *Fish physiology, *Fish behavior, Fish passages, Fish guiding, Toxicity, Inhibitors, Water pollution effects, Psychological aspects, Social behavior (Animals).
Identifiers: *Ethanol, *Goldfish, *Learning.

The effects of exposure of goldfish (15.20 cm long) to various concentrations (400 to 650 mg/100 ml) of ethanol were investigated relative to rate of learning and to retention of learning. Large amounts of ethanol generally interfere with performance. Subjects continuously exposed for 6 hrs 'adapted' to high ethanol levels. The reduction in the observed pharmacological effect of ethanol is due more to the prolonged presence of ethanol in the brain than to whether the level is rising or falling. There is a difference between the behavioral effect of ethanol, with a low congener content, and bourbon, with a high congener content. The goldfish is offered as a heuristic model for investigation of biological effects of ethanol. (LeGore-Washington)
W71-09669

STATE-DEPENDENT OR 'DISSOCIATED' LEARNING WITH ALCOHOL IN THE GOLDFISH,
Boston City Hospital, Mass. Alcohol Study Unit; and Harvard Medical School, Boston, Mass.
Ralph S. Ryback.
Quarterly Journal of Studies on Alcohol, Vol 30, No 3, p 598-608, September, 1969. 4 tab, 28 ref. National Inst of Mental Health Grant No MH-09245-01.

Descriptors: *Alcohols, *Fish physiology, *Fish behavior, Fish passages, Fish guiding, Toxicity, Inhibitors, Water pollution effects, Psychological aspects, Social behavior (Animal).
Identifiers: *Goldfish, *Carassius auratus*, Learning.

State-dependent learning with alcohol was investigated in 32 large goldfish, each trained in a Y-maze daily until a criterion of 18 out of 20 correct turns was obtained. On the next day the groups were either trained in an alcohol solution or in water, and were later tested in alcohol or in water. Results indicated that alcohol during training impaired learning, but that its effect during testing depended on its presence during training. In a second experiment, 4 groups of 6 fish were either trained in water or in an alcohol solution (400 mg per 100 ml) after being immersed in the alcohol for 2 hrs, and were tested 3 days later in water or in the same concentration of alcohol. An additional 6 fish were trained in alcohol after being in the alcohol for 6 hrs, and were tested 3 days later in water. The group taught in alcohol, but tested in water exhibited poor knowledge retention, but all other groups showed good retention. The results are discussed in relation to blackouts in alcoholics and learning under the influence of alcohol. (LeGore-Washington)
W71-09670

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects of Pollution

TOXICITY OF PESTICIDES WITH A HIGH CONTENT OF 4,6-DINITRO-O-CRESOL FOR FISH (In Czech),

Vyzkumny Ustav Rybarsky a Hydrobiologicky Vodnany, Prague (Czechoslovakia).

Z. Svobodova.

English summary. Buletin VUR Vodnany, Vol 6, p 20-25, 1970. 4 tab, 12 ref.

Descriptors: *Pesticides, *Toxicity, *Lethal limit, *Toxins, *Organic pesticides, *Agricultural chemicals, Bioassay, Physiological ecology, Fishkill, Mortality, Pesticide kinetics, Organic compounds, Pollutant identification, Water pollution effects, Runoff, Chemcontrol, Pesticide residues.
Identifiers: Cresol, LD-50, DNOK.

The toxicity to fish of newly developed pesticides containing 4,6-dinitro-o-cresol (DNOK) was investigated. The trade compounds were Nitrosan 50, Rafex 50, Zimni postrik I and Zimni postrik II (winter spray I and II). Toxicity depends upon percent DNOK content, upon the response of the pH noxious bath, and upon the nature of the remaining substances contained in the preparation. According to results, it is possible to arrange the preparations in order of decreasing toxicity: Zimni postrik II, Rafex 50, Nitrosan 50 and Zimni postrik I. Nevertheless, all the above must be considered noxious to fish. (LeGore-Washington)
W71-09671

TOXICITY OF PCP FOR THE 'DOJO' FISH, MISGURNUS ANGUILLICAUDATUS (CANTOR), WITH SPECIAL REFERENCE TO THE ESTIMATION OF SIZE FACTOR (In Japanese),

Ihara Agricultural Chemicals Inst., Shimizu (Japan).

Sumio Nagasawa, Shoji Asano, and Kazunobu Kondo.

English summary. Japanese Journal of Applied Entomology and Zoology, Vol 7, No 4, p 300-306, 1963. 1 fig, 2 tab, 7 ref.

Descriptors: *Bioassay, *Toxicity, *Lethal limit, *Weight, *Statistical methods, *Analytical techniques, *Phenols, *Fish physiology, Regression analysis, Poisons, Toxins, Laboratory tests, Testing, Water pollution effects, Environmental effects.
Identifiers: *Body weight, *Dose, Drugs, Correction factors, Multiple regression.

In many experiments relative to effects of drugs and poisons on animals differing in size but otherwise similar, the same dose is given to each individual as if its action were independent of body size. A size factor for equalizing individual differences in body weight can be determined experimentally for each drug by multiple regression. This approach was applied to the rate of effect of pentachlorophenol (PCP) on the 'Dojo' fish. After exposure of each fish to PCP, the lethal time was measured in minutes and the following regression was obtained: $Y = -0.05834 + 0.58337x_1 - 0.16823x_2$, where: $Y = \log(100/\text{minutes survival})$, $x_1 = \log \text{ppm of dose}$, and $x_2 = \log \text{grams of fish body weight}$. Lethal dose to body weight was not directly proportional. (LeGore-Washington)
W71-09672

SEXUAL DIFFERENCE IN HEAT RESISTANCE OF THE OZARK MINNOW, DIIONDA NUBILA (FORBES),

Arkansas Univ., Fayetteville, Dept. of Zoology.

Claude D. Baker, William H. Neill, and Kirk Strawn.

Transactions of the American Fisheries Society, Vol 99, No 3, p 588-591, July 1970. 1 fig, 11 ref. NSF Grant No GY-322.

Descriptors: *Heat resistance, *Environmental effects, *Fish physiology, *Physiological ecology, *Lethal limit, *Water temperature, Bioassay, Acclimatization, Temperature, Sexual maturity, Gonads, Mortality, Fishkill, Fish diseases, Aquatic environment, Water quality, Fish reproduction, Resistance, Heated water, Thermal water.
Identifiers: Sex, Sex differences, Death point, End point.

The intraspecific variation in heat resistance in the Ozark minnow, *Dionda nubilus* was studied. Fish were acclimated for 7 days and subjected to a stress of 36.5, 37.0 or 37.5°C. Cessation of gill movement was considered the death point. In general, pooled sample median resistance times of males were less than half those of females tested at equivalent temperatures. Brightly colored males, i.e., those approaching spawning condition, were generally the first of a particular sample to die. The difference between male and female heat resistance could not be attributed to size. (LeGore-Washington)
W71-09673

EFFECT OF M.S. 222 ON NITROGEN EXCRETION OF THE BLUEGILL (LEPOMIS MACROCHIRUS),

Loyola Univ., Chicago, Ill. Dept. of Biology.

Jan Savitz.

The Journal of the Elisha Mitchell Scientific Society, Vol 85, No 4, p 150-151, Winter 1969. 1 tab, 10 ref. US Dept of Interior, Graduate Educational Grant No 14-17-007-403 (G).

Descriptors: *Water pollution effects, *Fish physiology, *Nitrogen, Bioassay, Chemical wastes, Environmental effects, Fish toxins.
Identifiers: *MS 222, *Anesthetics, *Fish anesthetics, *Excretion, Drugs, Drug effects, Biochemical wastes.

Because M.S. 222 (tricaine methanesulphonate) anesthetizes fish, it was also expected to lower their nitrogen excretion rate. Static bioassays were used, with pre- and post-treatment water samples being analyzed for nitrogen content. The nitrogen excretion rates for bluegills treated with 0.003% M.S. 222 for one day were not significantly different from those of untreated controls. (LeGore-Washington)
W71-09675

PRELIMINARY REPORT ON THE BENTHIC FAUNA OF THE RIVER TESHIO (In Japanese),

For primary bibliographic entry see Field 05B.

W71-09676

THE 1967 SHARK KILL IN SAN FRANCISCO BAY,

East Bay Regional Park District, Oakland, Calif.; and California Academy of Sciences, San Francisco, Calif. Steinhart Aquarium.

Ronald A. Russo, and Earl S. Herald.

California Fish and Game, Vol 54, No 3, p 215-216, 1968.

Descriptors: *Water pollution effects, *Fishkill, *Mortality, *Elasmobranchs, *Sharks, Water pollution sources, Fish behavior, Bottom fish, Physiological ecology, Environmental effects, Fish conservation, Fish diseases.
Identifiers: *Stingrays, *Rays, San Francisco Bay, Triakis sp, Rhinotriakis sp, Notorynchus sp, Myliobatis sp.

During July and August, 1967, more than 725 elasmobranchs of four species (Triakis semifasciata, Rhinotriakis henlei, Notorynchus maculatus and Myliobatis californicus) were collected from a fishkill in the Alameda Beach area of San Francisco Bay. Of interest was the aberrant behavior of the shark, *R. henlei*, which often and repeatedly beached themselves. All four species are bottom dwelling elasmobranchs, as opposed to fast-swimming elasmobranch species. The responsible pollutant, therefore, must have been something which spread over the bottom of the bay for a considerable area and which had a breakdown period of greater than two months. The source of the contamination was not located. (LeGore-Washington)
W71-09677

TOXICITY AND TREATMENT OF DE-INKING WASTES CONTAINING DETERGENTS, International Pacific Salmon Fisheries Commission, New Westminster (British Columbia).

D. W. Martens, R. W. Gordon, and J. A. Servizi. International Pacific Salmon Fisheries Commission, Progress Report No 25, 1971. 24 p, 2 fig, 8 tab, 15 ref.

Descriptors: *Water pollution effects, *Detergents, *Chemical wastes, *Water pollution sources, *Water pollution treatment, *Salmon, *Fish physiology, *Oxygen demand, *Biochemical oxygen demand, *Toxicity, *Waste treatment, Cleaning, Pink salmon, Sockeye salmon, Industrial wastes, Waste water treatment, Lethal limit, Pulp wastes.
Identifiers: *Paper processing, *Detoxification, Fraser River, De-inking wastes, Nalco 808, Sterox MJ-b.

Some lethal and sublethal effects on juvenile sockeye (*Oncorhynchus nerka*) and pink salmon (*O. gorbuscha*) of proposed de-inking wastes and their contained detergents were investigated. Toxicity was attributed primarily to the waste's content of nonionic detergents, Nalco 808 and Sterox MJ-b, which caused lethargy, excessive mucous secretion on gills and depressed oxygen consumption at concentrations less than the lethal level. The biochemical oxygen demand (BOD) of de-inking wastes was easily reduced by biological treatment, but the wastes were generally not readily detoxified owing to resistance of the detergents to degradation. Detergents were removed from solution by activated carbon, but this method of treatment would be impractical. The alternatives for treatment of the proposed wastes appeared to be selection of detergents which would be readily detoxified during biological treatment, or selection of a method capable of removing the detergents. (LeGore-Washington)
W71-09678

II. SUBLETHAL EFFECTS AND CHANGES IN ECOSYSTEMS: ASSESSMENT OF THE EFFECTS OF POLLUTANTS ON PHYSIOLOGY AND BEHAVIOUR,

Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.

J. M. Anderson.

Proceedings of the Royal Society of London B, Vol 177, p 307-320, 1971. 11 fig, 1 tab, 21 ref.

Descriptors: *DDT, *Chlorinated hydrocarbon pesticides, *Water pollution effects, *Acclimatization, *Salmonids, *Fish physiology, *Water temperature, *Lethal limit, *Inorganic compounds, *Physiological ecology, *Environmental effects, Salmon, Trout, Temperature, Pesticides, Potassium compounds, Water quality.
Identifiers: *Chronic pollution, *Dinitrophenol, *Potassium cyanide, Salvelinus sp, Salmo sp.

The effects were studied of chronic pollution upon salmonid fishes. It is noted that exposure to DDT influences temperature selection and acclimation by salmon (*Salmo salar*) and brook trout (*Salvelinus fontinalis*). Low doses lower, and high doses raise the preferred temperature. Likewise, DDT raises the lower lethal temperature of fish, although it has no apparent effect on the upper lethal temperature. Effects of potassium cyanide and dinitrophenol upon temperature preference are also discussed, as are the effects of DDT upon learning and the biological effects of heavy metals. Ecological implications of these observations are discussed. (LeGore-Washington)
W71-09679

MASS MORTALITY OF THE CREVALLE JACK, CARANX HIPPOS (LINNAEUS) ON THE ATLANTIC COAST OF MASSACHUSETTS, Southeastern Massachusetts Univ., North Dartmouth.

James G. Hoff.

Chesapeake Science, Vol 12, No 1, p 49, March 1971. 1 fig, 4 ref.

Descriptors: *Fishkill, *Mortality, *Water temperature, *Cold springs, *Migration, *Fish physiology, *Environmental effects, *Cold re-

assistance, Temperature, Spring waters, Running waters, Fish diseases, Aquatic environment, Ecology, Physiological ecology, Saline water fish, Water pollution effects.

Identifiers: *Estuarine fish, *Caranx sp., Jack crevalle, Crevalle jack, Natural pollution.

A hydrographic and biological survey was conducted in the Slocum River, Massachusetts for over two years prior to October 18, 1969. On this date, over 200 dead juvenile jack crevalle (*Caranx hippos*) were found, although the mortality is estimated to have been greater. Death was reasoned to have been caused by low water temperature (7.4 - 9.0°C). Other species were apparently unaffected. (LeGore-Washington)
W71-09680

AVOIDANCE OF ANOXIC CONDITIONS BY THE SAND SHRIMP, CRANGON SEPTEMSPINOSA SAY,
Maine Univ., Orono.
Paul A. Haefner, Jr.
Chesapeake Science, Vol 12, No 1, p 50-51, March 1971. 1 fig, 1 tab, 5 ref. NSF Grant GB-6856.

Descriptors: *Dissolved oxygen, *Animal physiology, *Physiological ecology, Oxygen sag, Bioassay, Shrimp, Bioindicators, Environmental effects.
Identifiers: *Anoxia, *Hypoxia, *Avoidance, *Detection, *Sensory detection, Sand shrimp, Crangon sp.

The sand shrimp, *Crangon septemspinosa*, can detect and does avoid hypoxic and anoxic environmental conditions. Tests were carried out in a preference chamber at 5C and at 15 ppt salinity. Nitrogen gas was bubbled through water to create the hypoxic condition. The survival value of the demonstrated behavior becomes obvious when one considers that this species is often subjected to localized hypoxic stress in its estuarine environment. (LeGore-Washington)
W71-09682

WATER QUALITY CRITERIA FOR EUROPEAN FRESHWATER FISH. REPORT ON EXTREME PH VALUES AND INLAND FISHERIES,
Food and Agriculture Organization of the United Nations, Rome (Italy). European Inland Fisheries Advisory Commission.
R. Lloyd.
European Inland Fisheries Advisory Commission Technical Paper No 4, 1968. 24 p, 1 tab, 75 ref.

Descriptors: *Water pollution effects, *Lethal limit, *Hydrogen ion concentration, *Acidity, *Alkalinity, *Freshwater fish, *Fish behavior, *Aquatic environment, *Reviews, Impaired water quality, Resistance, Acidic water, Fishkill, Mortality, Pollutants, Water properties, Acid streams, Fish, Fish diseases, Fish physiology, Physiological ecology.
Identifiers: *Avoidance, Toxic mechanism, Mechanisms, Physiology.

A normal range of pH values is known to support good fisheries. A critical review is presented of published and unpublished data on direct and indirect effects of extreme pH on fish. There is no definitively established pH range within which a fishery remains unharmed and outside which it is damaged, but there is a gradual deterioration of the fishery as the pH values are further removed from the normal range. A pH range of 5-9 is not directly lethal to fish, but the toxicity of several common pollutants is markedly affected by pH changes within this range. Below pH 5.0, fish mortalities may be expected, and the productivity of a fishery is reduced. Some species may be acclimated to values as low as 3.7. Data on high pH are not extensive and probably reflect the lesser importance of this aspect. pH values between 9 and 10 may be harmful to a few species of fish, and higher levels are lethal to many more. It is observed that fish avoid zones of extreme pH value. (Katz-Washington)
W71-09683

MINERALIZATION OF ORGANIC PHOSPHORUS IN OLIGOTROPHIC LAKE SEDIMENTS,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.

Dwight A. Webster, and Carl L. Schofield.
Available from the National Technical Information Service as PB-201 002, \$3.00 in paper copy, \$0.95 in microfiche. Technical Report No 29, April 1971, 25 p, 7 fig, 6 tab, 15 ref. OWRR Project A-026-NY (1).

Descriptors: Lakes, *Oligotrophy, Lake soils, Limnology, *Sediments, *Phosphorus, Compounds, Organophosphorus, Compounds, Aquatic plants, *Nutrient requirements, Fertility, *Soil chemistry, Benthic flora, Enzymes, Water pollution effects.

An investigation of the amount, forms, lability, and significance of the sediment organic phosphorus pool was conducted in two small, oligotrophic lakes in the Adirondack Mountain region of New York State. The lakes differed markedly in productivity, but similar morphometric features (low mean depth and low ratio of water volume/ sediment area) enabled the sediments to play significant, but contrasting roles in the metabolism of the lakes. In the unproductive lake, the sediments behaved mainly as a sink for phosphorus. Benthic plants in this lake showed evidence of phosphate limitation (low content of 'stored' phosphate and high phosphatase activity), resulting from low sediment phosphate availability. Rates of organic phosphorus mineralization were low and partly inhibited by low substrate availability. The low lability of both inorganic and organic phosphates was attributed to the high retention capacity of an iron dominated retaining phase in the sediments. Sediments in the productive lake were considered to constitute a considerable reservoir of available phosphate. The benthic community was well developed and nutritional assay of the plants indicated that they were well supplied with phosphate. The sediments in this lake were dominantly autochthonous, low in Fe and Al, and had a low phosphate retention capacity. Substrate availability was greater, as were hydrolysis rates of organic phosphorus. Mineralized phosphate was more readily available, primarily because the inorganic phosphate retaining phase was near saturation, thus resulting in the formation of a pool of highly labile surface phosphate.
W71-09738

ROLE OF EXCRETED CHLORTETRACYCLINE IN MODIFYING THE DECOMPOSITION PROCESS IN FEEDLOT WASTE,
Colorado State Univ., Ft. Collins. Dept. of Microbiology.
G. Keith Elmund, S. M. Morrison, D. W. Grant, and M. P. Nevins, Sr.
Bulletin of Environmental Contamination and Toxicology, Vol 6, No 2, 1971, p 129-131.

Descriptors: *Farm wastes, Biodegradation, *Biochemical oxygen demand, Bactericides, Toxicity, *Stabilization, Bioassay, Biological treatment, Diets, Water pollution effects, Feeds, Cattle, Ruminants, Pollutant identification.
Identifiers: Feedlot wastes, Dietary antibiotic, Rumen microflora, *Chlortetracycline.

Quantitative bioassays of fresh feedlot manure revealed that approximately 75 percent of the dietary chlortetracycline was excreted. The antibiotic concentration was 14 microgram/gm of fresh feedlot manure, and 0.34 microgram/gm of aged feedlot manure. Standard BOD₅ values on manure from control steers and manures from steers receiving dietary chlortetracycline demonstrated that antibiotic supplementation of animal feeds may alter the microflora participating in the stabilization of feedlot manure. The effect of ingested chlortetracycline is two fold: (1) ingested antibiotic selects for a microbial population relatively inefficient in the stabilization process and (2) antibiotic supplementation apparently alters the digestive processes in the animal, resulting in manures which are less biodegradable as measured

by the standard BOD₅ procedure. (Christenburg-Iowa State)
W71-09749

POLLUTION, PESTICIDES AND THE PEOPLE -- AGRICULTURE AND OUR NATURAL ENVIRONMENT.
Greater Des Moines Chamber of Commerce, Iowa. Agricultural Dept.

33rd Annual (Forum), National Farm Institute, February 11-12, 1971, Des Moines, Iowa, 107 p.

Descriptors: *Farm wastes, *Pesticides, *Sediment, *Water pollution effects, Fertilizers, Economics, Legislation, Water pollution control, Benefits, Costs, Agriculture standards, Water quality, Taxes, DDT, Population, Livestock, Environment, Sewage.
Identifiers: Conservancy districts.

The proceedings of the National Farm Institute include papers concerned with the various aspects of pollution and today's environment. Various pollutants which are discussed include farm wastes, fertilizers, pesticides, and sediment. In addition, other papers report on population aspects, legislation, economics of pollution control, and interest groups concerned with pollution. A wide array of views and potential control systems are examined. (See also W71-09753 thru W71-09764) (White-Iowa State)
W71-09752

WHAT DO WE MEAN BY POLLUTION,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 05A.
W71-09753

THE SPORTSMAN'S VIEW,
National Wildlife Federation.
Phillip Douglas.
In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 15-22.

Descriptors: *Pesticides, *DDT, Water pollution effects, Conservation, Biodegradation, Recreation, Diseases, Beneficial use, Toxicity, Solubility, Fish, Birds, Biocontrol, Cultural control.
Identifiers: *Biological concentration, Primary effects, Secondary effects.

Both sides of the pesticide problem are presented in this paper. Pesticides, and in particular DDT, have been used successfully to help control typhus fever, malaria, and dutch elm disease among others. These beneficial effects are sometimes offset by their harmful residues. The DDT molecule combines four properties that are responsible for its behavior in the environment: (1) toxicity to almost all animal life; (2) persistence; (3) mobility; and (4) solubility properties. Many examples of fish and bird fatality are pointed out as the result of the accumulation of DDT. Usually these are the higher animals in carnivorous food chains. Twelve steps or courses of action are recommended to help alleviate the problem. (See also W71-09752) (White-Iowa State)
W71-09754

THE CITIZENS' VIEW OF POLLUTION,
League of Women Voters of the United States, Washington, D.C. Environmental Quality Program.
Donald Clusen, Mrs.
In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 7-13.

Descriptors: *Environment, *Water pollution effects, Pollution abatement, Legislation, Governments, Research and development, Water quality, Standards, Water Quality Act, Taxes, Agriculture.

The author attempts to give societies view of pollution while admitting that the role of spokesman is a dangerous one. Trying to describe pollution or

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Group 5C—Effects of Pollution

what it is constitutes a problem as varied as trying to prescribe solutions. There is no national consensus on environmental questions unless it is that a problem exists and the time to deal with it is now. An aroused public must insist that more be done, and faster, to abate pollution. Equally important is the preparation of a number of alternatives. Water resource development must be viewed as an integral part of the national effort to protect and improve the quality of man's environment. The general public has demonstrated that they want their money spent for pollution abatement. People want to have a voice in the choices to be made, they want to see some progress made, and they want environmental concerns to have a higher priority - in government, business and agriculture. (See also W71-09752) (White-Iowa State) W71-09755

THE FARMERS' CONCERN, Gilbert Stanek.

In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 23-29.

Descriptors: *Wastes, *Water pollution effects, Dieldrin, DDT, Mercury, Pesticides, Insecticides, Herbicides, Resistance, Research and development, Education, Regulation.
Identifiers: *Panic power, Mis-use, Tolerance level.

Farmers have four areas of concern in the environmental pollution field. The first is 'panic power' created by news media and other sources that cry out in unsure, uninformed voices about the uncertainties of pollution. The second area is mis-use or the improper handling of wastes and pesticides by farmers as well as non-farmers. The third area deals with tolerance levels. What criteria should be used and what levels should be set are questions which remain largely unanswered. The fourth area of concern to farmers is that they are a minority group. We are warned that if the American farmers' efficiency of production is jeopardized by banning of pesticide usage, the consumer will suffer through increased food prices because of reduced production. Research, education and regulation are key steps to preserve our standard of living. (See also W71-09752) (White-Iowa State) W71-09756

POPULATION GROWTH RATE SHOULDN'T GET ALL THE BLAME, Bureau of the Census, Washington, D.C. Conrad Taeuber.

In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 31-39.

Descriptors: *Human population, *Growth rates, Fertility, Fecundity, Census, Cities, Water pollution effects, Natural resources.

Population growth characteristics of the United States are pointed out. The growth rate is traced from pre-war times to present, with projections being made for future growth. Pollution and other social ills are not primarily a result of our rate of population growth. Changing standards and habits, in activities, technology, and the style of life have much more to do with the accumulation and disposition of waste materials and pollutants than does the number of persons involved. (See also W71-09752) (White-Iowa State) W71-09757

PESTICIDES,

Environmental Protection Agency, Washington, D.C. Pesticide Advisory Committee, William M. Upholt.

In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa p 49-56.

Descriptors: *Pesticides, *DDT, Diseases, Insecticides, Public health, Toxicity, Pesticide residue, Hazards, Poisons, Beneficial use, Water pollution effects.

Identifiers: *Parathion, Malaria, Cancer.

Pesticides are discussed with three main areas of emphasis. DDT is used as an example, but the principles are intended to apply to pesticides generally. The first area of emphasis is of the beneficial use of DDT. Increased production and the control of malaria are two main benefits. Human health hazards from pesticides are next pointed out. Death and illness have been attributed to pesticide poisoning. Currently the human health hazard that is most controversial is the possibility of cancer or birth defects from exposure to pesticide concentrations. Environmental hazards are the last area of concern. Biological accumulation and persistence in the environment are two main problems. The author suggest a drastic reduction in the use of DDT as one solution. Pesticides are useful, but they all carry some risk of damage to man or the environment. (See also W71-09752) (White-Iowa State) W71-09758

LIVESTOCK WASTE,
Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05D.
W71-09759

SEDIMENT: EVERYBODY'S POLLUTION
PROBLEM,
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 05B.
W71-09760

ECONOMICS OF POLLUTION CONTROL,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W71-09761

CURRENT CONSERVANCY LEGISLATION,
Iowa House of Representatives, Des Moines.
For primary bibliographic entry see Field 05G.
W71-09762

POLLUTION CONTROL DECISIONS - WHO
SHOULD MAKE THEM,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-09763

AGRICULTURAL BENEFITS FROM URBAN
POLLUTION CONTROL,
Office of the Secretary of the Army, Washington, D.C.
For primary bibliographic entry see Field 05D.
W71-09764

SPECIFIC COMPOSITION OF PHYTOPLANKTON IN A LAKE WARMED UP BY WASTE-WATER FROM A THERMAL POWER STATION AND IN LAKES WITH NORMAL TEMPERATURES,
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland).
J. Poltoracka.
Translation from Polish AEC-tr-7194. Acta Societatis Botanicorum Poloniae, Polish, Vol. 37, No. 2, 1968, p. 297-325, 5 fig., 1 tab., 5 ref.

Descriptors: *Thermal powerplants, *Lakes, Temperature, Phytoplankton, Algae, Heated water, Population, Water pollution effects.
Identifiers: Species, Taxons.

A preliminary evaluation of the specific composition of phytoplankton was carried out in Lakes Lichen, Mikorzyn and Slesin, characterized by different temperatures caused by the activity of the powerplant at Konin. The highest water temperatures were displayed by Lake Lichen (7.4-27.5C), and the lowest temperatures prevailed in Lake Slesin (0.8-20.7C). During the entire period of investigation in all three lakes, 305 species were found and 414 taxons were identified. Predominant

among them were Bacillariophyceae (44 percent), chlorophyceae (34 percent) and cynonophyceae (11 percent). The highest number of phytoplankton components (285) were found in Lake Lichen, and their lowest number (197) was ascertained in Lake Slesin, which was associated with great differences in the share of chlorophyceae whose highest number was found in the warmest, Lake Lichen, whereas their lowest number was discovered in Lake Slesin, the coldest lake. The number of species of algae in Lake Lichen was rather stable throughout the year but fluctuated seasonally in other lakes. A most marked correlation between the number of the taxons of algae and surface water temperature was observed in Lake Lichen. With respect to the size of individual population, 14 planktonic species were dominant at various periods in different lakes. (Upadhyaya-Vanderbilt) W71-09767

ELECTRIC POWER GENERATION AND THE ENVIRONMENT,
Westinghouse Electric Corp., Pittsburgh, Pa. Environmental Systems Dept.
James H. Wright.
Westinghouse Engineer, Vol. 30, No. 3, May, 1970, p. 66-80, 8 fig., 7 tab., 9 ref.

Descriptors: *Thermal pollution, *Environment, *Thermal powerplants, *Radiation, *Standards, *Temperature, Background radiation, Tritium, Water pollution effects.
Identifiers: Air pollutants, Krypton, Discharged heat, Heat dissipation, Exposure, Pressurized water reactors, Fossil fuels.

In this review, effects of steam electric generating stations, their emissions and resulting effects of those emissions on local and global environments have been briefly discussed. The United States, with 6 percent of the world's population, consumes 35 percent of the fossil fuels available and produces more than its share of pollution. Typical background exposures result in radiation doses to local residents in the range of 100 to 200 millirem per year. However, much larger exposures have been observed in certain locations such as in Kerala, India (1300 millirem per year) and granite areas of France (265 millirem per year). A brief history of establishment of radiation standards and a summary of Federal Radiation Council standards is given. Radiation from reactor effluents has been studied for exposure to the general population following typical releases and exposure at site boundary during normal plant operation. Results of the calculation of radiation releases from a 1000 MWe pressurized water reactor plant is given. Long term build-up of radioisotopes in the biosphere, carbon monoxide, oxides of nitrogen and sulfur, particulates and hydrocarbons emissions are also discussed. Federal Water Quality criteria for temperature, methods of heat dissipation and heat release on a planetary scale is discussed briefly. (Upadhyaya-Vanderbilt) W71-09768

MERCURY POLLUTION: INTEREST IN IT NOW ON THE UPSWING,
Industrial Pollution Control, Inc., Westport, Conn.
T. W. Lesperance.
Water and Wastes Engineering, January, 1971, p. A13-16.

Descriptors: *Heavy metals, *Chemical wastes, Water pollution sources, Poisons, Water pollution effects, Standards, Industrial wastes, Waste water treatment, Fish, Toxicity, Human pathology, Public health.
Identifiers: *Mercury.

Since industries became aware of the danger of mercury pollution, mercury consumption has dropped 11% in the last two years. The industries have started reclaiming and recycling large quantities of mercury that were formerly wasted. A standard of 0.005 mg/l of mercury in drinking water has

been proposed. Mercuric chloride at .0001 molar concentration was shown to inhibit several biological processes to values less than 5% of the original rate. The main effect on man is to the central nervous system. The best method of the detection of mercury is the colorimetric determination with dithizone. A list of possible industrial sources of mercury pollution is discussed. Among the possible treatment methods condensation precipitation, reverse osmosis and dialysis, lime treatment, etc., are mentioned. (Novotny-Vanderbilt)
W71-09774

MERCURY IN MAN,
Washington Univ., Seattle. School of Medicine.
Neville Grant.
Environment, Vol. 13, No. 4, p. 2-15, May, 1971, 8 fig., 29 ref.

Descriptors: *Heavy metals, *Poisons, *Toxicity, Food chains, Path of pollutants, Environmental effects, *Human diseases, *Public health, Fish, Foods, Fungicides, Agricultural chemicals, Standards, Air pollution, Water pollution effects, Circulation, Chromosomes.
Identifiers: *Mercury, Acceptable daily intake, *Methyl mercury, Human body, Brain, Tissue, Fetal damage, Half-life.

A series of alarming mercury contamination events is presented including the recent finding of 36 ppm of mercury in some health food tablets, made from compressed seal liver. Pathways of mercury in the system are illustrated, the cycle beginning with industry burning natural fuels. These emissions in the USA contribute some 275-1800 tons of mercury being released to the air annually. Mercury reaches man through food, particularly fish. Agricultural products are also of importance because of mercurial fungicides being freely used. Effects of various forms of mercury on man are depicted, levels of exposure are discussed, relation of methyl mercury levels in blood to physical hazard and specific areas of concentration in the human body are demonstrated. The relationship between methyl mercury intake and levels of methyl in brain tissue has been calculated. (Oleszkiewicz-Vanderbilt)
W71-09778

THERMAL POLLUTION FISHKILL.

American Association of Professors in Sanitary Engineering Newsletter, Vol. 6, No. 3, p. 15, April, 1971 (taken from Sports Fishing Institute Bulletin).

Descriptors: *Fishkill, *Thermal powerplants, *Temperature, *Thermal pollution, *Leakage, Bioassay, Acclimatization, Water pollution effects.
Identifiers: *Susquehanna River, Pennsylvania Power and Light, Rapid temperature drop.

A 720-MW generation unit at a thermal power plant on the Susquehanna River developed a water leak on February 4, 1971, and had to be shut down. This resulted in a sudden drop of water temperature which caused an estimated fishkill of 15,388 fish of value. A sudden 44F temperature drop-to 36F-caused the kill. This was clearly a thermal-pollution caused fishkill because the fish accumulated below the plant in the vicinity of warm water influence and died of exposure to the cold when the artificial heat had been cut off. The note also mentions thermal pollution studies on rapid water temperature changes, conducted at Vanderbilt University which demonstrates the extremely slow rates of temperature decrease which may still prove fatal to fish. (Oleszkiewicz-Vanderbilt)
W71-09781

DOW SUE BY ONTARIO FOR POLLUTION DAMAGE.

Chemical Week, Vol. 108, No. 12, p. 12, March 24, 1971.

Descriptors: *Heavy metals, Water pollution control, *Jurisdiction, *Lake Erie, Standards, Chlorine, Water pollution effects.
Identifiers: *Mercury, Dow Chemical of Canada, Ontario, *St. Clair River, *Detroit River.

The Ontario government's \$25 million mercury pollution suit against Dow Chemical of Canada may set a precedent in instances where industry allegedly despoils the environment. In addition, the suit asks that Dow render harmless the mercury sediments on the bottom of St. Clair and Detroit Rivers, Lake St. Clair and Lake Erie or pay the province an additional \$10 million for dredging the bottom. The new Federal Department of Environment for Renewable Resources said that it will require for all plants a maximum discharge of 0.005 lb. mercury/ton of chlorine by September 1, 1971, and by the end of the year limitation to the natural background. It is reported that Dow has reduced its release to 0.0009 lb. of mercury/ton chlorine. (Oleszkiewicz-Vanderbilt)
W71-09784

EFFECTS OF PULP MILL EFFLUENT ON WATER QUALITY AND BIOTA TRACE ELEMENT CHARACTERISTICS,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
J. M. Bewers, and G. J. Pearson.
Atlantic Oceanographic Laboratory Report 1970-8, November 1970, 57 p, 5 fig, 14 tab, 11 ref. AOL Report 1970-8.

Descriptors: *Water pollution effects, *Pollutant identification, *Pulp and paper industry, *Pulp wastes, *Water quality, *Biota, *Trace elements, Suspended load, Sediments, Solid wastes.
Identifiers: Transparency.

An attempt to obtain representative histograms of the chemical environment by employing neutron activation analysis to determine naturally occurring elements at fairly low levels was made in 1965 in a 400 acre tidal lagoon in Pictou County, Boat Harbor, Nova Scotia. This area is a treatment facility for wastes from the Scott Maritimes Bleached Kraft Pulp Mill. Four types of filter-feeding organisms were studied in this area of high concentrations of suspended solids and large quantities of unnatural chemical species. The chemical composition of the biota and suspended solids and the distribution of the suspended solids were studied to reflect the chemistry of the habitat. (Ensign-PAI)
W71-09793

LAMINARIA SACCHARINA AND MARINE POLLUTION IN NORTH-EAST ENGLAND,
Liverpool Univ. (England). Dept. of Botany.
E. M. Burrows, and C. Pybus.
Marine Pollution Bulletin, Vol. 2, No. 4, p 53-56, April 1971.

Descriptors: *Pollutant identification, *Bioindicators, *Algae, Growth rates, Cultures, Suspended load, Sewage, Industrial wastes, Silts, Water pollution effects.
Identifiers: *England, *Laminaria saccharina.

The growth rate of Laminaria saccharina in both the laboratory and in the field has been studied as an indicator for the effects of pollution on the north-east coast of England. This species provides a constant substrate for other marine organisms over a large area of the coast making it an important component of the coastal ecosystem. Laminaria saccharina is very sensitive to its environment and therefore is capable of giving a graded response to different types and degrees of pollution. The factor thought to inhibit growth most was the presence of silt; however pollution of the waters themselves having deleterious effects on growth cannot be ruled out. (Ensign-PAI)
W71-09795

MERCURY IN THE ADRIATIC,
Tokyo Univ. (Japan). Dept. of Urban Engineering and Kobe, Univ. (Japan). Dept. of Public Health.
Jun Ui, and Shoji Kitamura.
Marine Pollution Bulletin, Vol. 2, No. 4, p 56-58 April 1971.

Descriptors: *Water pollution, *Heavy metals, *Fish, *Food chains, *Human diseases, Public health, Toxicity, Environmental effects, Water pollution effects.
Identifiers: *Mercury, *Adriatic Sea, Minamata disease, Genetical change, Japan, Sweden, Italy.

Environmental pollution by organic mercury compounds in the Adriatic is reviewed. Methyl mercury compounds accumulated in the biosphere in natural food chains have led to causing diseases in humans. These diseases and the sources of mercury pollutants causing these diseases in Japan, Sweden and Italy are discussed. (Ensign-PAI)
W71-09796

EFFECT OF CRUDE OIL AND AN OIL-SPILL DISPERSANT ON REEF CORALS,
Bellairs Research Inst., St. James (Barbados).
John B. Lewis.
Marine Pollution Bulletin, Volume 2, No. 4, p 59-62 April 1971.

Descriptors: *Oil wastes, *Emulsions, *Industrial wastes, *Coral, *Marine animals, Reefs, Detergents, Water pollution effects.
Identifiers: Caribbean, Barbados Coast, Portia porites, Agaricia agaricites, Favia fragum, Madracis asperula.

Four species of corals from the reefs on the west coasts of Barbados were tested in laboratory experiments for the effects of crude oil and oil-spill detergents. All four species were found to be sensitive to pollution by both crude oil and the oil-spill dispersants. All were more affected by the dispersant than by the crude oil. Both pollutants had a harmful effect upon corals at concentrations of 100 to 500 ppm and recovery after 24 hr. exposure was not complete at these concentrations. (Ensign-PAI)
W71-09797

STUDIES OF ESTUARINE DEPENDENCE OF ATLANTIC COASTAL FISHES,
National Marine Fisheries Service, Highlands, N.J. Sandy Hook Marine Lab.
John Clark, W. G. Smith, Arthur W. Kendall, Jr., and Michael P. Fahay.
Bureau of Sport Fisheries and Wildlife. Technical Papers, No. 28, August 1969, 132 p, 70 fig, 3 tab, 13 ref.

Descriptors: *Estuaries, *Coasts, *Atlantic Ocean, *Fishes, Migration, Coastal engineering, Pollutants, Data collections, Temperature, Salinity, Zooplankton, Trawling, Water pollution effects.

The extent that migratory fishes of the Atlantic coast depend on estuaries as essential habitat during the early stages of their lives and the effects on fishes from physical disruption and pollution of estuaries caused by twenty years of coastal development was studied by the Sandy Hook Marine Laboratory. The basic data from a series of surveys, eight cruises of the research vessel Dolphin, from Cape Cod, Massachusetts to Cape Lookout, North Carolina during a one year period from December 65 to December 66 is reported. The data includes temperatures, salinities, zooplankton volumes, and the midwater trawl collections of fishes. (Ensign-PAI)
W71-09800

RUNOFF OF DEICING SALT: EFFECT ON IRONDEQUOIT BAY, ROCHESTER, NEW YORK,
Rochester Univ., New York. Dept. of Geological Sciences.
For primary bibliographic entry see Field 05B.

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Group 5C—Effects of Pollution

W71-09803

SUPPLEMENTAL IRRIGATION WITH STREAM WATER CONTAMINATED BY ACID MINE DRAINAGE,

Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center. For primary bibliographic entry see Field 03C. W71-09816

CONVOLUTION APPROACH TO THE SOLUTION FOR THE DISSOLVED OXYGEN BALANCE EQUATION IN A STREAM,

Geological Survey, Fort Collins, Colo. For primary bibliographic entry see Field 05B. W71-09820

UNSOLVED PROBLEMS OF AQUATIC RADIOECOLOGY,

Institute of Biology of the Southern Seas, Sevastopol (USSR). For primary bibliographic entry see Field 05B. W71-09847

RADIOECOLOGICAL INVESTIGATION IN THE REGION OF MURUROA ATOLL (TUAMOTU ISLAND),

Institute of the Biology of the Southern Seas, Sevastopol (USSR). For primary bibliographic entry see Field 05A. W71-09848

NATURAL AND ARTIFICIAL RADIONUCLIDES IN SEAFOODS AND MARINE PROTEIN CONCENTRATES,

Oregon State Univ., Corvallis. Dept. of Oceanography. For primary bibliographic entry see Field 05A. W71-09849

UPTAKE OF RADIOACTIVE NUCLIDES BY AQUATIC ORGANISMS: THE APPLICATION OF THE EXPONENTIAL MODEL,

Tokyo Univ. (Japan). Dept. of Fisheries. Y. Hiyama, and M. Shimizu. Environmental Contamination by Radioactive Materials, Vienna, International Atomic Energy (1969), p 463-476.

Descriptors: *Marine animals, *Radioisotopes, Absorption, Marine algae, Marine fish, Invertebrates, Crustaceans, Mollusks, Strontium radioisotopes, Zinc radioisotopes, Iodine radioisotopes, Cobalt radioisotopes, Water pollution effects. Identifiers: Cesium radioisotopes, Cadmium radioisotopes, Cerium radioisotopes, Echinoderms.

A compartmental model was used to correlate experimental data on radionuclides (Cs, Sr, Zn, Cd, Ce, I, and Co) uptake by marine algae, fish and invertebrates. For some systems the concentration factors varied with time as much as 100-fold. (Bopp-NSIC) W71-09850

TURNOVER AND CONCENTRATION OF RADIONUCLIDES IN FOOD CHAINS,

Oak Ridge National Lab., Tenn. Health Physics Div. D. E. Reichle, P. B. Dunaway, and D. J. Nelson. Nuclear Safety, Vol 11, No 1, p 43-55 (Jan-Feb 1970).

Descriptors: *Food chains, *Mathematical models, *Radionuclides, Radioactivity effects, Water pollution effects, Nuclear wastes, Public health, Metabolism, Toxicity.

More substantial bioenvironmental information will be required to evaluate future nuclear installations. A simple source-pathway-receptor model requires pathway identification, data on assimilation by each link (organism) in the pathway, and

determination of the biological turnover of each radionuclide. For chronic releases of radioactivity to the environment, evaluation of the concentration factors alone will often suffice; for acute releases, evaluation of other biological variables is needed to predict the time-dependent radionuclide concentrations in organisms. The biological concentration and turnover of radionuclides by animals are summarized in this paper, and data are presented for use in environmental models and correlation with characteristics (e. g., body size) that allow estimation of absolute values for many different animal groups based on existing experimental data. (Bopp-NSIC) W71-09851

RESEARCH ON ECOLOGICAL STUDIES ON THE DYNAMICS OF PLANKTONIC BLUE-GREEN ALGAE WITH SPECIAL REFERENCE TO THEIR MICROSTRATIFICATION.

Minnesota Univ., Minneapolis.

COO-1820-2 (1970), 6 p.

Descriptors: *Aquatic algae, *Lakes, *Phytoplankton, *Density stratification, Speciation, Vertical migration, Aquaria, Growth rates, Sedimentation, Buoyancy, Wind velocity, Convection, Water pollution effects.

Species associations at various depths are fortuitous, transient, and dependent upon physical control manifest by the abiotic environment, rather than upon any direct biological control. Individuals comprising the phytoplankton community are not bound to a substrate, and are entirely mobile. Vertical distribution is influenced by differential growth rates at various depths, sedimentation, buoyancy, wind, and thermal convection. Currently, proportionately more time is being devoted with several laboratory models of the study lakes. (Bopp-NSIC) W71-09852

EFFECTS OF CHRONIC EXPOSURE OF CHINOOK SALMON EGGS AND ALEVINS TO GAMMA IRRADIATION,

Washington Univ., Seattle. Coll. of Fisheries. L. R. Donaldson, and K. Bonham. Transactions of the American Fisheries Society, Vol 99, No 1, Jan 1970, p 112-119.

Descriptors: *Chinook salmon, *Radioactivity effects, *Fish eggs, Fry, Water pollution effects, Gamma rays, Columbia River.

Chinook salmon eggs and alevins were exposed continuously to low levels of gamma radiation from the instant of fertilization until the yolk sac was completely absorbed. The level of irradiation exposure was gradually increased from 0.5 roentgen/day for the 1960 brood year to 10 roentgen/day for 1968. (The total exposure for 1968 was 820 roentgen.) There were no damaging effects found at 0.5 roentgen/day. Data for the higher levels of exposure will be evaluated as the adults return from the sea. (Bopp-NSIC) W71-09853

EXCRETION OF IODINE BY PERCH,

Helsinki Univ. (Finland). S. Takatalo, S. Kolehmainen, and J. Miettinen. Transactions of the American Fisheries Society, Vol 99, No 3, Jul 1970, p 515-517, 2 fig.

Descriptors: *Iodine radioisotopes, *Perches, Absorption, Instrumentation, Radioactivity techniques, Metabolism, Water pollution effects.

Biological half lives of iodine in perch were determined at 13 and 25°C by whole body counting of I-131. Iodine excretion followed a two-exponential function. At 13°C the half life of the slow component was 9 days; the fast component, 1.5 days. At 25°C the half lives were 5 days and 15 hours, respectively. The slow component is believed to

represent clearance from the thyroid organ; the fast component, clearance from plasma. (Bopp-NSIC) W71-09854

RADIATION ECOLOGY IN FRESHWATER COMMUNITIES,

Battelle Memorial Inst., Richland Wash. Pacific Northwest Labs. C. E. Cushing.

Available from NTIS. Report BNWL-SA-3291, May 21, 1970, 17 p, 22 ref. AEC Contract No At (45-1)-1830.

Descriptors: *Radionuclides, *Aquatic life, *Public health, *Ecology, Oligotrophy, Phosphorus radioisotopes, Strontium radioisotopes, Iodine radioisotopes, Zinc radioisotopes, Cobalt radioisotopes, Absorption, Water pollution effects, Nuclear wastes, Reviews, Columbia River, Food webs.

Identifiers: Yttrium radioisotopes, Zirconium radioisotopes, Ruthenium radioisotopes, Cesium radioisotopes, Barium radioisotopes, Cerium radioisotopes, Scandium radioisotopes, Chromium radioisotopes, Manganese radioisotopes, Iron radioisotopes, Sodium radioisotopes, Copper radioisotopes, Arsenic radioisotopes.

This short review considers the following aspects of radionuclide cycling: (1) the mode of uptake, (2) rates of uptake, (3) retention-elimination, (4) food-web relationships, (5) environmental effects, and (6) dispersal of radionuclides. It is concluded that the presence of radionuclides in the freshwater environment, disregarding their source, can provide us with a wealth of ecological data. Information ranging from the movement of a single element from one organism to another, or from one tissue to another, to data helping to untangle the complexities of entire aquatic food-webs can be gained with properly designed experiments and treatment of the data. The dynamics of radionuclide cycling are basically no different from their stable counterparts, but their value lies in the increased precision of measurement, particularly at concentrations too low to measure by standard analytical procedures. (Bopp-NSIC) W71-09855

POLONIUM-210 AND LEAD-210 IN THE MARINE ENVIRONMENT,

Department of Industries, Cape Town (South Africa). Div. of Sea Fisheries. L. V. Shannon, R. D. Cherry, and M. J. Orren. Geochimica et Cosmochimica Acta, Vol 34, 1970, p 701-711.

Descriptors: *Lead radioisotopes, *Sea water, *Phytoplankton, *Zooplankton, Absorption, Water pollution effects, Biology, Geochemistry, Ocean currents, Radioactivity techniques. Identifiers: Polonium radioisotopes.

A method is outlined for determination of lead-210 and polonium-210 in sea water by solvent extraction, followed by electrodeposition and alpha counting. The mean activities of 29 samples collected at a depth of 20 m in the sea around the Cape of Good Hope during March 1969 were 38×10 to the minus 15th power c/1 for lead and 20×10 to the minus 15th power c/1 for polonium. Variations in concentrations could in part be ascribed to different water masses and current systems. For 11 zooplankton and 3 phytoplankton samples collected during the same period, the mean activities were 33 pc/kg wet weight for lead and 399 pc/kg wet weight for polonium. Using the data presented and making certain assumptions, removal times from the upper mixed layer were calculated to be about 5 yr for lead-210 and 0.6 yr for polonium-210. (Bopp-NSIC) W71-09856

RADIOACTIVITY CONTENTS IN SOME PLANKTON AND SEA WATER SAMPLES COL-

LECTED DURING THE PERIOD BETWEEN 1960 AND 1968, Parma Univ. (Italy).
L. Tassi-Pelati, and C. Truilzi.
Energia Nucleare (Milan), Vol 16, No 5, p 311-320, 1969, 5 fig, 4 tab, 15 ref.

Descriptors: *Radioisotopes, *Plankton, *Protozoa, *Strontium radioisotopes, Potassium radioisotopes, Radium radioisotopes, Absorption, Oceans, Water pollution sources, Fallout, Water pollution effects.
Identifiers: Cerium radioisotopes, Europium radioisotopes, Manganese radioisotopes, Promethium radioisotopes, Antimony radioisotopes, Zirconium radioisotopes.

Accumulation of strontium-90 by Ligurian plankton containing the protozoa Acantharia which has a skeleton containing SrSO₄ and by Adriatic plankton containing no Acantharia was compared. A higher level of radioactivity in the Ligurian Sea than in the Adriatic was attributed to the uptake of strontium-90 by Acantharia. It was concluded that species of Acantharia are useful as strontium-90 indicators. Radioactivity in plankton in the northern Adriatic and Ligurian Seas from 1961-68 followed closely the fallout. Strontium-90, cerium-144, europium-155, manganese-54, promethium-147, antimony-125, zirconium-95, potassium-40, and radium-226 were measured by radiochemical methods in selected samples of plankton and seawater. It was concluded that plankton may be used as an immediate indicator of environmental contamination from radioactive fallout. (Bopp-NSIC)
W71-09857

HAZARDS OF INTERNAL CONTAMINATION OF A HUMAN POPULATION FROM THE RADIOACTIVE POLLUTION OF WATERS, (IN FRENCH), Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires. R. Bittel, and G. Lacourly.
Available from NTIS. Report CEA-CONF-1548, 1970, 12 p.

Descriptors: *Food chains, *Radioisotopes, *Radioactivity effects, Human population, Public health, Water pollution effects, Nuclear wastes, Mathematical models.

A simple model is used to estimate the contamination of population groups from the aquatic food chain. The effects of varying parameters (amount of ingested food, ecological and physiological transfer factors) are studied. The model is used to obtain the doses delivered from drinking water, water used for irrigation, inland aquatic food chains, and marine food chains. (Bopp-NSIC)
W71-09858

RESEARCH ON THE MARINE FOOD CHAIN, PROGRESS REPORT, JULY 1969-JUNE 1970, PART III, California Univ., San Diego-La Jolla. Inst. of Marine Resources.
J. D. H. Strickland.
Available from NTIS. Report UCSD-10-P-20-68, (1970). 257 p.

Descriptors: *Food chains, *Sea water, *Oceanography, Nutrients, Salinity, Productivity, Temperature, Phosphates, Nitrates, Silicates, Ureas, Instrumentation, Fathometers, Plankton, Phaeophyta, Chlorophyll, Photosynthesis, Water pollution effects, Pollutant identification.

During cruises based from Callao, Peru, oceanographic parameters were mapped continuously: temperature, salinity, nitrate, silicate, and chlorophyll fluorescence; and vertical profiles were obtained for plant nutrients (nitrate, ammonium, urea, silicate, and phosphate) and chlorophyll fluorescence. Methods of measurement and computer programming are discussed. (Bopp-NSIC)
W71-09859

RADIOACTIVITY AND FALLOUT: THE MODEL POPULATION, Brookhaven National Lab., Upton, N.Y.
George M. Woodwell.
Available from NTIS as BNL-12401 (1967). Proceedings of the Symposium on Challenge for Survival, Columbia University Press, New York, 1970, p 159-169.

Descriptors: *Water pollution effects, *Radioisotopes, *Human population, Public health, Strontium radioisotopes, Pesticides, DDT, Persistence, Toxicity, Hazards, Pesticide residues, Radioactivity, Water pollution sources.
Identifiers: Cesium radioisotopes, Iron radioisotopes.

Problems of releasing both radioactive and chemical toxic material into the environment are discussed with respect to hazards to populations. The common assumption that the environment is large enough for toxic materials to dilute into innocuousness (on a world-wide scale is questioned with respect to various isotopes such as cesium-137, strontium-90, and iron-55; and with regard to various persistent pesticides, especially DDT. (Bopp-NSIC)
W71-09860

RADIOACTIVITY TRANSPORT IN WATER: SUMMARY REPORT, Texas Univ., Austin. Center for Research on Water Resources.
For primary bibliographic entry see Field 05B.
W71-09861

INFLUENCE OF THE PHYSIOCHEMICAL FORM OF RUTHENIUM ON CONTAMINATION OF MARINE ORGANISMS, (In French), Departement de la Protection Sanitaire, Cherbourg (France). Section de Radio-ecologie.
For primary bibliographic entry see Field 05B.
W71-09863

WATER QUALITY INFLUENCES ON OUTDOOR RECREATION IN THE LAKE ONTARIO BASIN, Bureau of Outdoor Recreation, Ann Arbor, Mich.
Robert J. Henley.
In: Proceedings, Tenth Conference on Great Lakes Research, Ann Arbor, Braun-Brumfield, Inc, 1967, p 427-440.

Descriptors: *Water quality, *Recreation, *Swimming, *Water pollution effects, Bacteria, Algae, Fish, Sewers, Runoff, Wastes, Water supply, Effluents, Streams, Lakes, Rivers, Reservoirs, Boating, Eutrophication.
Identifiers: *Lake Ontario, Water turbidity, Industrial plants, Water sports.

The relationships between water quality and the uses of recreational water resources in the Lake Ontario basin are surveyed. There is a discussion of water quality indices (high bacteria counts, algae masses, fish mortality and water turbidity). Recreation value of water is analyzed in light of the influence of poor water quality on swimming, with particular attention to situations in which swimming has been banned by public officials. The value of pollution control to such water recreation is stressed. Predictions are made for the future demand of the public for swimming and other water-related recreation activities and indications point to an increase in this demand. (Murphy-Rutgers)
W71-09880

5D. Waste Treatment Processes

REMOVAL OF RADIOISOTOPES FROM LIQUID WASTES BY SORPTION IN LOCAL MINERALS, Atomic Research Centre, Bombay (India).
U. Chandra.
Availability: NTIS. BARC-454, 1970. 29 p.

Descriptors: *Waste disposal, *Waste water treatment, Radioactive waste disposal, Water pollution sources, Absorption, Clays, Ion exchange, Cesium.
Identifiers: India.

Various naturally occurring minerals available in India have been extensively investigated for their suitability for treatment of radioactive liquid wastes at Trombay. Four general classes of sorbents were taken up for study and chiefly among the minerals are, Vermiculite, Attapulgite, Bentonite, and Lignite type coal products. It is concluded that though Vermiculite has been widely used as fixed bed ion exchange material, Attapulgite too is a very potential mineral because of its exceptionally high selectivity for radiocesium even in presence of macro amounts of inactive sodium in the waste solutions. (Houser-NSIC)
W71-09517

A REVIEW OF THE LITERATURE OF 1968 ON WASTEWATER AND WATER POLLUTION CONTROL - INDUSTRIAL WASTE, RADIOACTIVE, For primary bibliographic entry see Field 05G.
W71-09521

REUSE OF CHEMICAL FIBER PLANT WASTE WATER AND COOLING WATER BLOWDOWN, Fiber Industries Inc., Charlotte, N.C.
William J. Day.
Copy available from GPO Sup Doc as EP2.10:12090EOX10/70, \$0.70; microfiche from NTIS as PB-200 695, \$0.95. Water Pollution Control Research Series, October 1970. 66 p, 15 fig, 5 tab, 15 ref. EPA Grant No WPRD-100-01-68, Program No 12090 EUX 10/70.

Descriptors: *Water reuse, *Domestic wastes, *Industrial wastes, Activated sludge, Trickling filters, Lagoons, Tertiary treatment, Activated carbon, Flocculation, Algae, Sludge, Chromium, Toxicity, Neutralization, Hydrogen ion concentration, Temperature, Biochemical oxygen demand, Chemical oxygen demand, Cooling towers, *Waste water treatment.
Identifiers: *Micro screening.

Waste waters from a Fortrel Polyester manufacturing plant consisted of organic chemical process wastes, cooling system blowdown, and sanitary wastes from the plant. A water reuse program was instituted which consisted of: (1) pretreatment of cooling waters for removal of heavy metals; (2) in-plant modifications and additions to the existing system to increase treatment plant capacity; and (3) a post treatment system for effluent polishing prior to selected reuse. The final system consisted of: (1) a chromate reduction unit rated at 120 gpm for concentrations of up to 300 mg/l CrO₄ and designed for continuous operation; (2) equalization basins having a combined capacity of 195,000 gallons and containing sufficient mixing capacity to prevent short-circuiting and stratification; (3) a plastic media roughing filter consisting of two tiers of poly-vinyl chloride media 10 feet thick and 25 ft in diameter; (4) an aeration basin equipped with 175 hp of aeration and mixing capacity and using 100% recycle of clarifier sludge; (5) a peripheral flow type clarifier; (6) two series connected polishing ponds; (7) a micro screen or algae screen; (8) a flocculant and/or carbon unit; (9) a sludge pond; and (10) a digester. Chromium was removed from the cooling tower blowdown for \$.21 per pound of chromate removed. The plastic media trickling filter, used as a roughing filter, provided 40% BOD removal over a wide range of loading rates. The 0.33 mgd industrial and domestic waste water was treated and reused at a rate of 0.10 mgd for approximately 40 cents/1000 gallons. (Lowry-Texas)
W71-09524

MATHEMATICAL MODEL OF THE ELECTRODIALYSIS PROCESS, Process Research, Inc., Cambridge, Mass.
Kenneth T. Pruyn, Joseph J. Harrington, and J. Douglas Smith.

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

Copy available from GPO Sup Doc as I67.13/4:17090 FTA 7/69, \$0.70; microfiche from NTIS as PB-200 721, \$0.95. Water Pollution Control Research Series, July 1969. 70 p, 3 fig, 3 tab, 18 ref. FWQA Contract No 14-12-410, Program 17090 FTA 07/69.

Descriptors: *Computer simulation, *Mathematical models, Feasibility studies, Cost analysis, Electrodialysis, Separation techniques, Membrane processes, Semipermeable membranes, Anions, Cations, Demineralization, Desalination, Resistivity, Flow, Acid, Storage, Instrumentation, Pipes, Pumps, *Waste water treatment.

An electrodialysis unit was established as a control volume, and material balances around the control volume were formulated, involving input and output flows, types of charged particles to be exchanged, concentrations of charged particles, and percentage removal of individual ions as well as percentage removals of total ions. Significant parameters involved included spacer design geometry, membrane properties (resistivity, current efficiency, separation factors, etc.) and mode of operation of the stack (current density, products stream concentration, waste/product ratio, waste stream pH, etc.). Performance equations were then formulated for resistivity, D.C. power input, current efficiency, number of stacks required, and the pumping headloss. Cost analyses were then derived to include: (1) electrodialysis stacks, stack piping, distribution piping, and pumps for stack related costs; (2) rectifiers and process electrical for D.C. power costs; and (3) acid storage tanks, acid feed pumps, instruments, and miscellaneous equipment for auxiliary costs. Equations derived for capital costs were based on the January 1965 Engineering News-Record cost index. Operational costs were estimated and evaluated in the same manner. The program was run for plants of 1, 10, and 100 MGD, with capital and operating costs being \$164,620 and 7.07 cents/1000 gallons respectively for a 1 MGD plant. Program flow charts as well as actual computer outputs are presented. (Lowry-Texas) W71-09525

AEROBIC SECONDARY TREATMENT OF POTATO PROCESSING WASTES.

French (R. T.) Co., Shelley, Idaho.

Copy available from GPO Sup Doc as EP.2.10:12060 EHV 12/70, \$1.50; microfiche from NTIS as PB-200 623, \$0.95. Water Pollution Control Research Series, Dec 1970. 110 p, 68 fig, 5 tab, 13 ref. EPA Grant No WPRD 15-01-68, Program No 12060 EHV 12/70.

Descriptors: *Potatoes, *Industrial wastes, Activated sludge, Cost analysis, Technical feasibility, Economic feasibility, Aeration, Temperature, Alkalinity, Hydrogen ion concentration, Organic loading, Kinetics, Chemical oxygen demand, Biochemical oxygen demand, Dissolved oxygen, Chlorination, Disinfection, Coliforms, Sludge, Vacuum drying, Dewatering, *Waste water treatment.

Identifiers: *Food processing, Suspended solids.

The R. T. French Company, of Shelley, Idaho, has demonstrated the feasibility of using a complete mix activated sludge unit for secondary treatment of potato processing wastes. During the 1969-1970 processing season, both the activated sludge process and a flow through aeration process without secondary clarification were studied. The activated sludge unit was demonstrated to be capable of BOD removals, in excess of 90% over extended periods, with coliform removals in excess of 96%. With the flow through system, BOD removals ranged between 70 and 80%. Analysis of data obtained revealed that both the quantity of excess sludge produced and the amount of oxygen required were functions of the BOD removal rate and the mixed liquor volatile suspended solids concentration. The substrate removal rate coefficient was shown to be temperature dependent. The prevailing low air temperatures at the Shelley loca-

tion did not cause system failure, but data obtained demonstrated the need to consider temperature loss in system design. Total annual treatment costs, excluding costs for waste activated sludge disposal, were estimated to be \$0.38 per lb BOD applied, and \$0.21 per lb COD applied. Operation of thickener-clarifier on combinations of silt and biological solids was not successful. Failures with this unit demonstrated a need for the development of special silt removal and handling equipment for potato processing. (Lowry-Texas) W71-09526

A TECHNIQUE FOR IRRIGATING BOTTOM LAND HARDWOOD TREES WITH PAPERMILL EFFLUENT IN NORTH LOUISIANA,

Louisiana Polytechnic Inst., Ruston.

Ishtiaq Ahmed.

Masters Thesis, May 1970. 68 p, 2 fig, 6 tab, 43 ref. OWRR Project A-013-LA (1).

Descriptors: *Pulp and paper industry, *Irrigation, Industrial wastes, *Water reuse, Trees, Hydrologic cycle, Plant growth, Evaporation, Evapotranspiration, Interception, Precipitation (Atmospheric), Runoff, Storage, Temperature, Sampling, Color, Turbidity, Cost analysis, Waste water treatment.

Bottom land hardwood trees in Louisiana were irrigated with both black water and white water effluents from local papermills. Analyses were performed on the waters to determine the individual constituents and characteristics of each. White water was found to be predominantly sodium, while the major component of black water was found to be sodium bicarbonate. Average annual precipitation for the area was found to be 53 inches per year. Tests were conducted which established 19.3 inches/year the maximum permissible amount of mill effluent, mixed 9 parts of white water to 1 part of black water, which could be used to irrigate the forests to obtain optimum growth. The optimum growth recorded was 6.03% per year. Trees would be irrigated from April through September, the time when most tree growth occurs. Based on a life expectancy of 20 years, the cost of the project was determined to be \$7.43 per acre per year. Further research is needed in the form of a tree improving program to determine the optimum tree species for this particular application. Varying proportions of white water to black water should also be experimented with in order to achieve optimal conditions throughout the system. (Lowry-Texas) W71-09527

WATER FILTRATION OPTIMIZATION BY GEOMETRIC PROGRAMMING,

Texas A and M Univ., College Station. Dept. of Industrial Engineering.

Duane J. Wray.

MS Thesis. 54 p, 4 fig, 55 ref. OWRR Project A-011-TEX (3).

Descriptors: *Filtration, *Operations research, Mathematical studies, *Optimization, Flow, Headloss, Sands, Waste water treatment.

Identifiers: *Geometric programming, *Multi-media beds, Backwash.

Water filtration has been perpetuated since its conception by mainly 'rule of thumb' design with little mention made of actual determination of mechanisms by which filters work. Therefore, designs have been of the classical form, conforming not to economics or performance, but to tradition. Establishment of the various operational parameters has allowed the process to become amenable to economic optimization by the method of geometric programming. The method was applied to multi-media filters where the primary variables were: (1) depth of each media; (2) flow rate; (3) length of filter run; (4) head loss; and (5) equivalent grain diameter. Primary costs included original media cost amortized over a specified period, and the cost of the backwash water. A sample problem was analysed using the geometric programming method. The values used were those

which could conceivably be from a typical plant. The ease with which the sample problem was analyzed demonstrated the feasibility of the method as a practical design tool for engineers. The use of computers for performing the calculations would make geometric programming even more attractive, and work is continuing along those lines. (Lowry-Texas) W71-09528

THE EFFECT OF IRRIGATION WITH MUNICIPAL SEWAGE EFFLUENT AND SLUDGE ON SELECTED TREES, GRASSES, AND LEGUMES PLANTED IN BITUMINOUS STRIP-MINE SOIL,

Pennsylvania State Univ., University Park. Dept. of Forestry and Wildlife.

John Allen Dickerson.

Master's Thesis, Mar 1971. 88 p, 26 fig, 18 tab, 21 ref. OWRR Project B-020-PA (5).

Descriptors: *Strip mine wastes, *Acid mine water, *Vegetation establishment, Municipal wastes, Sludge, Water reuse, Trees, Grasses, Fescues, Germination, Mortality, Acidity, Hydrogen ion concentration, Alkalinity, Toxicity, Temperature, Monitoring, Sampling, Percolation, Pennsylvania. Identifiers: *Survival.

Many areas of Pennsylvania are covered with harsh bituminous spoils which have repeatedly resisted revegetation because of the toxicity of the spoil banks. 10 boxes each holding 512 cu ft or approximately 25 tons of material, were filled with spoil material from the Lower Kittanning bituminous coal seam. These boxes were then irrigated with municipal sewage plant effluent and sludge. The boxes were planted with seven tree species, two grass species, and two legume species with random arrangement. The 10 boxes were paired for weekly irrigation with sludge and effluent as follows: (1) control (no irrigation); (2) two inches effluent; (3) one-inch effluent and one-inch sludge; (4) two inches effluent and two inches sludge; and (5) 2 inches sludge. Temperatures, soil moisture content, and percolate quality were monitored for a 24 week period. Results of these tests showed that black locust trees had a survival rate overall of 90% and white pine trees had a survival rate of 74%. These factors combined with the excellent growth of both orchard grass and tall fescue suggested that municipal sludge and sewage effluent can help to ameliorate harsh conditions found on bituminous spoil banks. The spoil material used in this study had resisted conventional revegetation for 23 years, due mainly to highly acid (pH less than 3.0) and toxic conditions. (Lowry-Texas) W71-09529

SURVEY OF TREATMENT AND RECYCLE OF USED FISH HATCHERY WATER,

New Mexico State Univ., University Park. Dept. of Civil Engineering.

John Burkstaller, and R. E. Speece.

New Mexico State University, Engineering Experiment Station, Technical Report No 64, June 1970. 41 p, 5 fig, 1 tab, 24 ref. WRR Project A-018-NMEX (2).

Descriptors: *Fish hatcheries, *Water reuse, Temperature, Hydrogen ion concentration, Dissolved oxygen, Ammonia, Fish toxins, *Waste water treatment, Adsorption, Activated carbon, Catalysts, Filtration, Nitrification, Disinfection, Chlorine, Ozone, Ultraviolet radiation, Microorganisms, Viruses, E Coli, Fish diseases, Toxicity, Monitoring, Enzymes.

Identifiers: Bromine.

Re-use of fish hatchery water is becoming more attractive for the following reasons: (1) many water supplies are too cold and must be heated, and on a once through basis all heat remaining is wasted; (2) many areas do not have sufficient water supplies to raise full capacities of fish during dry months, and (3) spatial limitations are also becoming increasingly prevalent. Problems encountered in recycling

of hatchery water include: (1) smaller fish are much more susceptible to certain fish diseases and recycle can take disease producing organisms from older fish and start an epidemic among the younger fish; (2) ammonia is extremely toxic to fish even in very small amounts, and therefore, it must be removed from the water before re-use; and (3) for growing cold water fish, recycle water may become unsuitable since it eventually warms to the temperature of the surroundings. Various treatment methods tested to alleviate these problems include the use of ultraviolet light, chlorine, bromine, chlorine-bromine combinations, and the suggested use of ozone for disinfection. Use of these methods, however, would require additional treatment for residual removal. A typical installation involving U-tube aeration, biological filters for nitrification, and continuous monitoring of pH, D.O. and temperature is presented. (Lowry-Texas)
W71-09530

THE ROLE OF THE ENZYME 1-PHOSPHOFRUCTOKINASE IN THE METABOLISM OF CLOSTRIDIUM PASTEURIANUM W5.
National Inst. for Water Research, Pretoria (South Africa).
J. P. Kotze.
Water Research, Vol 3, 1969, p 83-91. 1 fig, 3 tab, 26 ref.

Descriptors: *Anaerobic digestion, *Anaerobic bacteria, Clostridium, Enzymes, Metabolism, Microorganisms, Hydrolysis, Degradation (Decomposition), Protein, Analytical techniques, Oxidation-reduction potential, Spectrophotometry, Chromatography, Sampling, Waste water treatment.
Identifiers: *Adenosine tri-phosphate, *Adenosine di-phosphate, Absorbance, Buffer, Glucose.

Clostridia have been shown to be the most numerous species of organisms in anaerobic digesters. Many attempts have been made to establish the exact mechanisms by which anaerobic degradation takes place. The metabolic pathways were examined for Clostridium Pasteurianum W5 by analyzing cell-free samples for enzymatic activity. Cl. Pasteurianum W5 has been documented concerning its lack of 6-Phosphofructokinase, and a new metabolic shunt to circumvent this lack of 6-PFK activity in the glycolytic degradation of carbohydrates has been proposed. Cl. Pasteurianum W5 was studied in pure culture to allow the sequence of the metabolic pathways to be more easily detected and studied. Glycose, fructose, mannitol, and sorbitol were used as substrates. Thin layer chromatography and spectrophotometric methods were utilized to detect small concentrations of enzymes. Hexose and hexitol degradation was found to proceed through the use of a 1-phosphofructokinase and mannitol-1-phosphate dehydrogenase shunt mechanism, while the lack of 6-phosphofructokinase had no significance. This work more fully elucidated the actual pathways by which anaerobic digestion proceeds in the clostridia, but further investigations continue. (Lowry-Texas)
W71-09531

AEROBIC HETEROTROPHIC BACTERIAL POPULATIONS OF SEWAGE AND ACTIVATED SLUDGE, IV. ADAPTATION OF ACTIVATED SLUDGE TO UTILIZATION OF AROMATIC COMPOUNDS.
Rutgers - The State Univ., New Brunswick. Dept. of Environmental Sciences.
T. B. S. Prakasam, and N. C. Dondero.
Applied Microbiology, Vol 19, No 4, p 663-670, Apr 1970. 3 fig, 4 tab, 15 ref. FWQA Program 17050 DFL 04/70.

Descriptors: *Enzymes, *Aromatic compounds, *Sewage, *Viability, Population, Aeration, Acclimatization, Nutrients, Heterogeneity, Biochemical oxygen demand, Filtration, Phosphates, Chlorides, Sulfates, Activated sludge, Waste water treatment.

Identifiers: *Enzyme repression, Stainer's technique, Glucose.

An activated sludge from a sewage treatment plant and a laboratory activated sludge developed on an artificial waste were compared for their ability to utilize 11 aromatic compounds. The settled sewage from a treatment plant in Marlboro, New Jersey was used as an inoculum to develop activated sludges in a laboratory. Mixed liquor from aeration tanks was used as authentic activated sludge. The artificial waste consisted of nutrient broth solids, glucose and salts. Sludge extract media was prepared by autoclaving 250 ml of the mixed liquor suspended solids acclimated to particular aromatic compound at 121 deg C for 15 minutes. Oxygen uptake was studied by usual monometric techniques, using constant volume respirometers and 15 ml flasks with 0.2 ml of 15% (w/v) KOH at 20 deg C. A sample of laboratory grown activated sludge unacclimated to aromatics and another mixed liquor from Marlboro sewage treatment plant were plated on artificial wastes. There were marked differences in numbers of organisms able to utilize the various aromatic compounds. After 3 weeks visible counts of sludges were between 286-354 million/ml. Counts for laboratory activated sludge were higher on all media, than corresponding counts for treatment plant activated sludge. (See also W71-09533) (Lowry-Texas)
W71-09532

AEROBIC HETEROTROPHIC BACTERIAL POPULATIONS OF SEWAGE AND ACTIVATED SLUDGE, V. ANALYSIS OF POPULATION STRUCTURE AND ACTIVITY.
Cornell Univ., Ithaca, N.Y. Dept. of Food Science.
T. B. S. Prakasam, and N. C. Dondero.
Applied Microbiology, Vol 19, No 4, p 671-680, Apr 1970. 2 fig, 7 tab, 17 ref. FWQA Program 17050 DFL 04/70.

Descriptors: *Activated sludge, *Aromatic compounds, Heterogeneous populations, Systematics, Frequency, Flocculation, Diversion, Oxidation, Sewage, Waste water treatment.
Identifiers: *Catechol sludge, *Artificial waste, *Microbial populations, Benzoate, Substrate utilization ability index, Oxidation index.

The confidence interval method and Mountford's index were tested in analyses of the microbial populations of 11 laboratory activated sludges acclimated to aromatic compounds. The gross and microscopic differences between the sludges acclimated were strongly indicative of profound changes during the adaptation of laboratory sludge. The microscopic populations were present in higher numbers in heterologously acclimated sludges than in homologously acclimated sludges. To evaluate the abilities of the bacteria and the oxides of the aromatic substrates a 'Substrate utilization ability index' (SUAI) was computed and compared with an 'Oxidation index' (OI). A high OI value indicated sludge had ability to oxidize corresponding substrates to a high degree. The sludges are compared to one another in a series of pairs accounting for bacterial types and frequencies. From the data compiled confidence limits around the mean (y) of the total differences were calculated and the level of significance was chosen at 10%. Analysis by Mountford's method provided quantitative comparison over the entire set of sludges and any desired groupings through the lowest common similarity values. Attempts at population analyses indicated each acclimated sludge differed greatly in microbial constitution. Analyses of the data by a statistical method used quantitative and objective evidence that the resulting populations were quite divergent in their microbial composition during the period of investigation. In retrospect, the need of further tests of the sensitivity of methods of population analysis of bacteria is evident. (See also W71-09532) (Lowry-Texas)
W71-09533

SYMPOSIUM-FIELD EVALUATION OF LAS AND ABS TREATABILITY.
Proctor and Gamble Co., Cincinnati, Ohio. Sanitary Engineering Research Services.

Proceedings, Industrial Waste Conference, 21, Vol L, No 2, p 724-756. 20 fig, 4 tab, 6 ref.

Descriptors: *Alkybenzene sulfonates, *Linear alkylate sulfonates, *Biodegradation, *Detergents, *On-site tests, Surfactants, Biochemical oxygen demand, Chemical oxygen demand, Sewage treatment, Waste water treatment, Ohio, Virginia, Wisconsin.
Identifiers: Columbus (Ohio), Woodbridge (Virginia), Manassas (Virginia), Plymouth (Wisconsin).

Four carefully documented on-site tests conducted at sewage treatment facilities evaluated the biodegradability of a new detergent surfactant, linear alkyl sulfonate (LAS), and compared its biodegradability to that of alkyl benzene sulfonate (ABS). Each study was carried out under the supervision of a different university and all found LAS-based detergent products were much improved in degradability over ABS products in similar operating conditions. Other significant conclusions were: (1) efficiency of LAS removal depended upon the efficiency of BOD removal, i.e., a system with 80 to 90% BOD removal could expect to degrade 80 to 90% of LAS, (2) effluent concentrations of active substance from an aeration-type treatment were reduced to 1-2 mg/l after changing to the use of LAS-based products, and (3) under corresponding conditions of 12 hour detention period and mixed liquor suspended solids of around 1500 parts per million, LAS removal was 70% compared to 30-50% for ABS. Graphs and data may be useful in the operation, treatment, and the design of new plants when LAS-based products come into general use. (Burdette-Texas)
W71-09534

ON IMPROVING WASTE WATER QUALITY.
Mobil Oil Co., East Chicago, Ind.

J. A. Hart.
Water and Sewage Works, Vol 117, No 9, Sept/Oct 1970, p IW/20-IW/26. 3 fig, 3 tab, 1 ref.

Descriptors: *Pollutants, *Waste water treatment, Oxidation, Effluents, Flocculation, Biochemical oxygen demand, Chlorination, Chemical oxygen demand, Indiana.
Identifiers: *Air-flotation, *Stripping, Sour-water, Great Lakes-Illinois River Basin Survey (GLIRB), Influent, Polyelectrolyte.

In February, 1965, a sour water stripper was put into service at Mobil Oil Company's East Chicago Refinery located on the Indiana Harbor Ship Canal. As a result the water's visual appearance was improved by the elimination of a black precipitate caused by sulfides. Sour water stripper's bottoms were of excellent quality containing essentially no sulfide, only 15 mg/l of ammonia-nitrogen and their reuse achieved a phenol reduction of 90%. In July, 1967 new criteria for the Indiana Harbor Ship Canal were restricted to require additional improvement in the quality of Mobil's wastewater effluent. It appeared that treatment should be provided for reducing oil content, suspended solids, phenols, ammonia-nitrogen and BOD. Another major objective was to improve the water's quality to permit further reuse as makeup in the refinery's cooling towers, reducing effluent volume and offering possibilities of reducing phenol and BOD. The objectives were all met by installing an air-flotation unit as a secondary treatment process. The results of the unit showed that a polyelectrolyte should be used to obtain the best possible water quality for reuse as cooling tower make-up. Before completion of the air-flotation installation several tests were run to determine effects of changing sour water stripper bottoms to cooling towers. The results indicated the existence of an environment in the cooling towers favorable for oxidizing phenols. No odors which would cause air pollution were de-

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

tested in the air leaving the cooling towers. (Lowry-Texas)
W71-09535

DESIGN GUIDES FOR BIOLOGICAL WASTE WATER TREATMENT PROCESSES-LABORATORY STUDIES OF THE PERFORMANCE OF THE CONTACT STABILIZATION PROCESS, Texas Univ., Austin. Center for Research in Water Resources.
Donnie W. Berryhill, Joseph F. Malina, Jr., and Rolf Kayser.
Technical Report EHE-70-16, CRWR-62, Texas University, Austin. 55p. FWQA Grant No WPRD 178-01-68.

Descriptors: *Activated sludge, *Organic loading, Biochemical oxygen demand, Aeration, Dissolved oxygen, Mixing, Acclimatization, Sampling, Sludge, Municipal waste water, *Waste water treatment, Texas.
Identifiers: *Contact stabilization, Suspended solids, Detention time, Oxygen uptake, Austin (Tex).

Laboratory scale tanks being fed 4 l/hr of waste water containing 100 mg/l Total BOD were operated as contact stabilization tanks. Volume of the stabilization tank was held constant at 4 liters throughout the experiment, while volume of the contact tank was varied between 1/2 and 4 liters. Organic loadings ranged from 0.31 to 0.72 lbs BOD per pound total suspended solids per day, with removal rates ranging from 0.24 to 0.51 lb BOD/lb TSS/day. One run was made with the system operated as a complete mix activated sludge unit. At loadings of 1.04 lb BOD/lb MLSS, .91 lbs/BOD/lb MLSS/day were removed. A dissolved oxygen probe attached to a battery powered mixer was used to measure oxygen uptake rates, which varied from 43 to 191 mg/l/hr in the contact stabilization units, and from 123 to 186 mg/l/hr in the activated sludge units. Short contact periods of from 10 to 15 minutes were sufficient to reduce the soluble BOD in the waste water to low levels, but substrate removal limits were not exceeded in any of the runs. Therefore, no minimum contact or stabilization periods could be established. Further oxygen studies using the prescribed testing procedures should be performed to supplement the data obtained. (Lowry-Texas)
W71-09536

ACCELERATED DIGESTION OF CONCENTRATED SLUDGE, Mississippi State Univ., State College. Dept. of Sanitary Engineering.
Adnan Shindala, Joseph V. Dust, and Alvin L. Champion.
Water and Sewage Works, Vol 47, No 9, p 329-332, Sept 1970. 2 fig, 3 tab, 16 ref.

Descriptors: *Digestion process, *Sewage, *Sludge, Anaerobic digestion, Economics, Alkalinity, Hydrogen ion concentration, *Waste water treatment.
Identifiers: *Thickening, Volatile acids, Temperature.

A study was made of the digestion of concentrated domestic sludge. The purpose of the investigation was: (1) to determine successful digestion of thickened sludge; and (2) to evaluate optimum solids concentrations combined with optimum digestion periods that would produce acceptable volatile solids reductions. Sludges tested with solid concentrations of 5, 15, 25, and 35% were digested for loading periods of 30, 20, 15, and 10 days under constant mesophilic temperature conditions and displacement loadings. Digested sludge with a volatile matter content of 44% was used to start digesters. Conditions inside the digesters were checked every 4 days. Raw sludge used was concentrated to 15%, 25% and 35%. A sludge volume of 1/2 l was used, and temperature was maintained between 92 deg and 95 deg F. The following parameters of the added sludge were known: (1)

weight, (2) percentage of solids and (3) percent of volatile matter. Several factors were observed in order to avoid digester failure: (1) pH, (2) alkalinity, (3) volatile acids and (4) temperature of digestion. With these factors in mind the following control tests were performed on sludge: (1) volatile acids, (2) pH, (3) total alkalinity, (4) volatile solids and (5) total solids. The results showed that concentration had a definite effect upon digestion. Percentage reduction and volatile matter decreased with increased concentration for all loadings. From the data compiled during this study, the following conclusions are drawn: (1) volatile acids and alkalinity increased with increase in solids concentration, (2) pH remained constant indicating pH was not a function of the increase in solids concentrations as long as alkalinity to volatile acids ratio was more than 1, (3) 15% solids produced maximum amount of gas per liter of sludge but 5% produced the most gas per unit of dry solids, (4) The percent reduction in volatile solids decreased with the increase in solids concentration, and (5) loadings of concentrated sludges up to 10 mg/day produced an acceptable volatile solids reduction. (Lowry-Texas)
W71-09537

USE OF SOIL TO TREAT ANAEROBIC LAGOON EFFLUENT: DESIGN AND OPERATION OF A FIELD DISPOSAL SYSTEM, Iowa State University, Ames. Dept. of Agricultural Engineering.
Dale H. Vanderholm, and Craig E. Beer.
Transactions of the ASAE, Vol 13, No 5, Sept-Oct 1970, p 562-564, 2 fig, 2 tab, 17 ref.

Descriptors: *Water reuse, *Irrigation, Farm wastes, Percolation, Infiltration, Lagoons, Organic loading, Rates of application, Aeration, Nitrification, Ammonia, Leaching, Sampling, Monitoring, Laboratory tests, Biochemical oxygen demand, Chemical oxygen demand, Hydrogen ion concentration, Nitrates, Phosphates, Chlorides, Odor, Insects, Waste water treatment.

12 individual plots of land, each 45 ft x 60 ft were subjected over a 6 month period to intermittent irrigation with effluent from an anaerobic lagoon. The design included: (1) a portable agricultural irrigation system; (2) an adequate drainage system to maintain favorable moisture conditions in the soil profile; (3) a sampling system and procedure to monitor system performance; and (4) measurement devices for inflow, outflow, and pertinent climatic data. Available moisture content (AM) was the criterion used to determine irrigation frequency. A .30 inch per hour application rate was used. Larger rates resulted in ponding and excessive runoff. Samples of the influent were obtained by placing catch pans on the field, while effluent samples were obtained from the sumps in the tile drains. Samples were analyzed for BOD, COD, pH, nitrogen, chlorides, and phosphates. No odor problems or insect nuisance problems developed. No noticeable corrosion or clogging problems were experienced in the irrigation equipment. COD, nitrogen, and phosphorus removals averaged 97%, 80%, and 99.% respectively. Chloride was not removed and hence no build-up problems were predicted. This method has been shown to be feasible for treating agricultural wastes, but design criteria depend upon individual conditions, and must be evaluated for each individual case. (Lowry-Texas)
W71-09538

A PRELIMINARY 'LEAST COST' STUDY OF FUTURE GROUNDWATER DEVELOPMENT IN NORTHEASTERN ILLINOIS, Illinois State Water Survey, Urbana.
A. F. Moench, and A. P. Visocky.
State of Illinois Department of Registration and Education, Circular No 102. 19 p, 10 ref.

Descriptors: *Water requirements, *Illinois, Aquifers, Groundwater, Dolomite, Sands, Gravels, Hydrology, Water utilization, Water management

(Applied), Water purification, Cost analysis, Amortization, Waste treatment.

Lake, McHenry, DuPage, Cook, Kane, and Will Counties in Illinois were analyzed for projected groundwater usage from 1980 to 2020. Three main groundwater sources of these areas are: (1) shallow sand and gravel aquifers, (2) shallow dolomite aquifers, and (3) deep sand stone aquifers. Pumpage from the shallow aquifers was limited to their known potential yield, but no limit was set for the deep aquifers until such time as the water level fell below the top of the main producing aquifer, at which time a rate which produced a constant water level would be mandatory. Unit costs at wells, pumps, power, and rehabilitation were estimated and amortized at 6% (in 1970 dollars). Treatment costs for such treatment as would achieve the same finished quality as treated Lake Michigan water were also included. Raw water costs were projected to vary between 2 and 14 cents/1000 gal depending upon the depth at the aquifer. Treated water cost estimates varied from 22 to 53 cents/1000 gal. 14 townships were found to be deficient in groundwater in 2020 by 147 mgd. This advance indication allowed the search for alternate water supplies to begin long before the shortage became critical. (Lowry-Texas)
W71-09539

THE OCCURRENCE OF FUNGI IN ACID-MINE DRAINAGE, Federal Water Pollution Control Administration, Cincinnati, Ohio.
For primary bibliographic entry see Field 05G.
W71-09541

CARNIVOROUS PLANTS IN ACTIVATED SLUDGE, Northwestern Univ., Evanston, Ill.
Wesley O. Pipes.
Proceedings, Industrial Waste Conference, 20, Vol XLIX, No 4, p 647-656, July 1965, 6 fig, 1 tab, 4 ref.

Descriptors: *Rotifers, *Nematodes, *Activated sludge, *Fungi, Sewage, Aeration, Nutrients, Autoclaved, Spores, Animal parasites, Waste water treatment.
Identifiers: *Zoophagus, Hyphae, Organelles, Agar cultures.

The Sanitary Engineering Research Laboratory of The University of California, Berkeley prepared a study concerned with the predatory fungi found growing in activated sludge. The fungi derives its sustenance by consuming rotifers and nematodes believed to play a part in the breakdown of waste organic matter and the formation of activated sludge flocs occasionally responsible for bulking. All samples of activated sludge examined for predatory fungi were obtained from an experimental pilot plant at The University. Aeration tanks used had a capacity of 600 gallons and treated settled domestic sewage at aeration times of about 6 hours. Four methods were employed to study the problem: (1) microscopic observations were used when large numbers of predatory fungi were to be found, (2) enrichment culture techniques were preferred for fungi in small numbers, (3) isolation was used in pure cultures using conventional mycological techniques, (4) studies on bulking confirmed that predatory fungi isolated in pure cultures and then transferred to autoclaved sewage would grow in sewage saprophytically. Results showed fungus was characterized by non-separate hyphae, 6-8 microns in diameter with short lateral branches. The fungus was undoubtedly the same one found by Cooke and Ludzack in laboratory activated sludge culture fed on synthetic industrial waste identified as Zoophagus Insidians. Zoophagus does not grow in autoclaved sewage. Reports established that predatory fungi do occur in activated sludge treating domestic sewage in a continuous-flow system. (Lowry-Texas)
W71-09542

FERMENTATION WASTE DISPOSAL IN GREAT BRITAIN, Borthwick (Thomas) Distillers Co. Ltd., London (England).
C. J. Jackson.
Proceedings, Industrial Waste Conference, 21, Vol L, No 2, Mar 1966, p 19-32. 8 tab, 11 ref.

Descriptors: *Fermentation, *Effluents, *Evaporation, *Oxidation, Sludge disposal, Filtration, Distillation, Waste water treatment, Estuaries, Microorganisms, Biochemical oxygen demand, Sewage, Waste disposal.
Identifiers: 'Floccor' installation, 'Polygrid' installation, Dilution, Treatability, Malts, Grains.

In fermentation industries microorganisms are utilized under controlled conditions to produce an end product. The microorganisms need an adequate nutrient medium resulting in a strong effluent after the removal of the main product. The problems in treating distillery effluents are determined by an optimization of 3 factors: (1) legal requirements, (2) technical feasibility and (3) economics and amenities. Since discharge of effluents to rivers and sewers is controlled, some degree of treatment is necessary. The most commonly used methods of treatment are: (1) to the sea and land, (2) precipitation by pH adjustment, (3) precipitation by chemical coagulation, (4) anaerobic decomposition, (5) aerobic decomposition, (6) combinations of aerobic and anaerobic and (7) evaporation/combustion. Before these methods can be considered certain questions are essential: (1) possibility of reducing volume of effluent, (2) is recycling possible with a consequent reduction in strength, (3) water recovery and recycling (4) if material removal from effluent can be sold or given away. Evaporation is the most commonly used method for receiving solids from effluent, but not always the most economical. TA 'Floccor' plant was tested in Scotland for treating condensate from evaporation of malt distillery spent wash. Mixture has BOD of 1,200 mg/l. Loadings on 3 stage unit are 5 lb/BOD/cu.yd/day and recirculation of 3:1 is used to provide wetting of filter elements. When the plastic filters were used results showed each stage loaded 5 lb/BOD/cu.yd/day removing 55% of load and effluent recirculation rate of 9:1. This performance indicated 'Floccor' installation would be more economical than conventional biological filters. (Lowry-Texas)
W71-09543

THE ECONOMICS OF REGIONAL POLLUTION CONTROL SYSTEMS, Michigan Univ., Ann Arbor. Dept. of Environmental Health.
Rolf A. Deininger.
Proceedings, Industrial Waste Conference, 21, Vol L, No 2, p 815-883. 11 fig, 1 tab, 12 ref.

Descriptors: *Waste water treatment, *Water quality, Economics, Systems analysis, Linear programming, Biochemical oxygen demand, Oxygen, *Water pollution control, *Regions, *Evaluation, Costs.
Identifiers: Mathematical formulation.

Investigations were carried out concerned with two main problems: (1) how treatment at various plants should be established to minimize total costs of waste treatment, and (2) consideration of the degree of treatment fixed and aspects of inter-community transfers of waste. The first problem compares costs with two schemes of pollution control: (1) where every with has some degree of treatment and (2) where upstream polluters are allowed to discharge as much waste as possible without violating water quality criteria set along the river. The main point made was that the costs of waste treatment increased approximately linearly for treatment range between 30% and 90% BOD removal, thus, there are 2 factors in the costs of water treatment: (1) decrease in costs with increase in size of plant and (2) increase in cost with increase in degree of treatment. Clearly, the economics of scale of waste treatment indicate that a joint treatment plant is more economical for 2 communities,

than each having its own plant. It was also shown that the minimum cost solutions can guarantee the same degree of water quality as the equal treatment policy at much less cost. The influence of various parameters, such as river flow, temperature, and formations for inter-community sewer and treatment systems were also investigated. (Lowry-Texas)
W71-09544

TREATMENT OF WASTES FROM FOOD MANUFACTURE AND COFFEE PROCESSING, Bostok, Hill and Rigby, Birmingham (England).
R. K. Chalmers.

Proceedings, Industrial Waste Conference, 22, Vol 1 II, No 2, July 1968, p 866-878, 1 fig, 4 tab, 4 ref.

Descriptors: *Industrial wastes, Organic wastes, Hydrogen ion concentration, Biochemical oxygen demand, Cost analysis, Evaporation, Separation techniques, Filtration, Centrifugation, Incineration, Screens, Temperature, Foods, *Waste water treatment.
Identifiers: *Food wastes, *Coffee, Custard powders, Jelly products, Dog food, Rice products, Weirs.

When an English General Foods factory was moved from a large city to a small town, it was faced with the need for a means of treating waste, especially from coffee manufacture, which could not be treated in the existing sewage disposal works at the new site, Banbury, Warwickshire. After investigating possible treatment methods, it was decided that physical means of reducing the effluent would be most advantageous. The treatment used was primarily based on segregation of the weak effluent and the strong effluent which contained the waste from the coffee plant. The essential components of the treatment unit are (1) strong and weak effluent collection pits, (2) storage tanks (3) duplicate evaporator feed tanks and a four-stage multiple evaporator for strong liquor treatment, (4) a weak effluent feed tank, duplicate hydro cyclones, pH correction tank, and a weir tank for weak effluent treatment, (5) duplicate centrifuges and two rotary vacuum filters for the grounds press effluents, (6) a paddle mixer, and incinerator boiler for the solids from the centrifuges, and (7) a segregation unit to divide the flow from the extraction columns. The product of the treatment was satisfactorily below the maximums set previously by Banbury authorities. The plant originally cost 220,000 Pounds with an operating costs of 50,000 Pounds per year. (Lowry-Texas)
W71-09545

THE USE OF AERO-HYDRAULIC GUNS IN THE BIOLOGICAL TREATMENT OF ORGANIC WASTES, Proctor and Redfern, Toronto (Ontario).
C. S. Dutton, and C. P. Fisher.

Proceedings, Industrial Waste Conference, 21, Vol L, No 2, March 1966, p 403-423, 7 fig.

Descriptors: *Oxidation lagoons, *Organic wastes, *Oxygenation, Aerobic treatment, Anaerobic conditions, Canneries, Activated sludge, Biochemical oxygen demand, Oxidation-reduction potential, Aquatic algae, *Biological treatment, *Waste water treatment.
Identifiers: Aero-hydraulic gun, Alliston (Ontario).

The aerated lagoon treatment of organic wastes is an economical and increasingly popular process. However, the degree of treatment has been limited by the nature of devices available for accomplishing oxygenation. Recent experiments utilized aero-hydraulic guns in simple aerated lagoons for treatment of organic wastes. The guns consisted of a polyethylene stack pipe, bubble generator, and an air supply that periodically released numerous small bubbles from the lagoon bottom. The resulting flow pattern of liquid from the lagoon bottom involved a strong radial current at the surface. Oxygenation capacity of the guns were derived in a series of curves that plotted lbs O₂/hr against free air

consumption. Correction factors permitted application of the curves to actual designs. A gun can also function as a positive sludge return pump by sealing up one of the ports and connecting a suction pipe. At a potato waste treatment facility in Alliston, Ontario, some 790,000 gpd of potato waste was discharged daily along with a load of 5,000 lbs BOD and a like amount of suspended solids. Recommendations for this facility were: (1) two conventional settling basins, each 24 ft square equipped with a sludge scraper, (2) a simple aerated lagoon equipped with 127 guns, and (3) two algae lagoons. Dr. C. P. Fisher studied the system and found BOD removal achieved by the aerated lagoon was approximately 90% with little or no measurable residual dissolved oxygen. There was no doubt that the thorough mixing produced by the guns was responsible to a greater or lesser degree for the high removals. Other studies were conducted on poultry and fruit canning wastes. (Burdette-Texas)
W71-09546

THE ISOLATION AND CHARACTERIZATION OF SORBITOL-6-PHOSPHATE DEHYDROGENASE FROM CLOSTRIDIUM PASTEURIANUM, National Institute for Water Research, Pretoria (South Africa).

P. J. DuToit, and J. P. Kotze.
Biochimica et Biophysica Acta, Vol 206, 1970, p 333-342, 8 fig, 4 tab, 8 ref.

Descriptors: *Enzymes, *Catalysts, *Inhibitors, Kinetics, Oxidation, Equilibrium, Analytical techniques, Laboratory tests, Separation techniques, Centrifugation, Isolation, *Electrophoresis, Hydrogen ion concentration, Chromatography, Spectrophotometry, Waste water treatment.
Identifiers: *Dehydrogenase, Enzyme activity, Buffer.

The procedure for isolating Sorbitol-6-P dehydrogenase included (NH₄)₂SO₄ fractionation, DEAE cellulose chromatography (twice), Biogel P 60 gel filtration, and Sephadex G200 gel filtration. After purification of 176.5-fold, the enzyme carried a negative charge at pH 8.6, and was determined by electrophoretic mobility to consist primarily of one species having a molecular weight between 74,000 and 94,000. The purified enzyme was specific for cofactors NAD⁺ and NADH, and substrates sorbitol-6-P and fructose-6-P. Optimum pH values of 8.5 and 10 were determined for the oxidation of sorbitol-6-P in Tris-HCl buffer and in glycine-NaOH buffer respectively. Michaelis-Menten constants K_m and inhibitor constants K_i were determined for all reactants of sorbitol-6-P dehydrogenase. Kinetic constants for sorbitol-6-P and NAD⁺ had low numerical values for Tris-HCl (pH 8.5) than for glycine-NaOH (pH 9.8). The reduced reactants NADH and sorbitol-6-P had K_m as well as K_i values, whereas the oxidized reactants, fructose-6-P and NAD⁺, displayed only K_m values, while the U_{max} values of both reactions were influenced by the concentration of the oxidized reactants. The reaction (fructose-6-P + NADH sorbitol-6-P + NAD⁺) at pH 7.0 had an equilibrium constant of 3.81 x 10 to the 8th power M⁻¹, indicating equilibrium as lying heavily on the side of sorbitol-6-P formation. (Lowry-Texas)
W71-09547

FOOD CANNERY WASTE TREATMENT BY LAGOONS AND DITCHES AT SHEPPARTON, VICTORIA, AUSTRALIA, Melbourne Water Science Inst. (Australia).
C. D. Parker.

Proceedings, Industrial Waste Conference, 21, Vol L, No 2, March 1966, p 284-302, 5 fig, 13 tab, 6 ref.

Descriptors: *Canneries, *Industrial wastes, Peaches, Apricots, Pears, Citrus fruits, Tomatoes, *Aerobic treatment, *Anaerobic digestion, Biochemical oxygen demand, Activated sludge,

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Cost comparisons, Sediments, Algae, Hydrogen ion concentration, Electric power, Sewage disposal, *Waste water treatment, *Oxidation lagoons. Identifiers: Shepparton (Australia), Oxidation ditches, Soup, Food wastes.

Cannery waste is characterized by high BOD and high acidity. The usual method of treatment is spray or flood irrigation or aerobic type lagoons with heavy dosage of sodium nitrate for odor control. In Shepparton, Victoria, expansions in the facilities of Shepparton Preserving Company, the largest cannery in the Southern Hemisphere, and the building of a soup cannery in the area caused problems in the treatment of the resulting sewage. There was a pressing need for an efficient means of purifying, without causing nuisance, the large seasonal flows of highly polluted food wastes from two canneries on areas closely adjacent to a prosperous and rapidly developing urban center. The short seasonal nature of cannery operations and consequent high capital cost made the problem even more difficult. It was decided to experiment with anaerobic and aerobic type lagoons and oxidation ditches. The waste from each firm is mixed with sewage plant effluent and treated in the new processing unit with very good results which are described in great detail. The total cost of the new unit, excluding the cost of inflow and outflow pipelines and labor and maintenance, was \$155,000 to the Preserving Co., and \$143,000 (American Dollars) to the soup cannery plus annual costs of \$5,364 and \$8,192 respectively, excluding pipelines, pumping stations, and maintenance labor. The net result was almost complete purification at costs the industries could accept. (Lowry-Texas) W71-09548

POLLUTION CONTROL FOR MINING AND PROCESSING OF INDIANA COAL,
Indiana State Board of Health, Indianapolis.
For primary bibliographic entry see Field 05G.
W71-09549

THE EFFECT OF NITROGEN AND PHOSPHORUS COMPOUNDS ON ONE OF THE MICROORGANISMS RESPONSIBLE FOR SLUDGE BULKING,
Toronto Univ. (Ontario).
Philip H. Jones.
Proceedings, Industrial Waste Conference, 20, Vol XLIX, No 4, p 297-315, July 1965, 12 fig, 8 tab, 30 ref.

Descriptors: *Sludge treatment, *Aquatic fungi, Carbohydrates, Molds, *Nitrogen, *Phosphorus, Analytical techniques, Activated sludge, Nutrient requirements, Water pollution sources, Waste water treatment.
Identifiers: *Sludge bulking, Geotrichum candidum, Nitrogen sources.

The term 'sludge bulking' refers to the development of poor settling properties in sludge and is defined as a biophysical response to some upset in the ecological balance of a mixed population of microorganisms. This phenomenon commonly occurs in municipal sewage-treatment plants where sewage which is rich in carbohydrates is found. Since such sewage is usually deficient in nitrogen and phosphorous, a study was undertaken to ascertain whether the microorganisms might actually become dominant due to the indirect effect of increasing BOD/N or BOD/P ratios. Evidence was sought to support the contention that a variety of filamentous microorganisms including *Geotrichum candidum* are closely associated with the sludge bulking phenomenon. Studies were done on a cross-section of organic and inorganic nitrogen sources when combined with a series of different carbon sources. Tests were also made to show the effect of allowing the concentration of inorganic phosphorous in an otherwise adequate medium. Several different phosphorus ratios were studied. Evidence obtained in these tests showed that in phosphorous or nitrogen deficient wastes,

Geotrichum hold a competitive advantage over the microbial population as a whole. (Lowry-Texas)
W71-09550

INDUSTRIAL WASTES FROM SEAFOOD PLANTS IN THE STATE OF ALASKA,
Alaska Department of Health and Welfare, Juneau, Alaska.
Charles L. Jensen.
Proceedings, Industrial Waste Conference, 20, Vol XLIX, No 4, p 329-350, 18 fig, 15 ref.

Descriptors: *Industrial waste, *Fisheries, Commercial fishing, Salmon, Crabs, Shrimp, Organic wastes, Alaska, Saline water fish, Chemical reduction, Slurries, Sewage treatment, Waste water treatment, Alaska, Waste disposal.
Identifiers: Kodiak, Fish meal, Sole, Flounder, King crab, Tanner crab, Dungeness crab, *Seafood wastes.

The seafood industry in Alaska is faced with a growing problem due to the huge amounts of waste generated in the processing of seafood. In 1964, waste from salmon was approximately 103 million pounds, king crab waste was 69.5 million pounds, dungeness crab waste was 10 million pounds, shrimp waste was 5.5 million pounds, and halibut waste 3.4 million pounds. The total cost to the processors was \$21 million. Changes in the fishing industry have lengthened operation time of processing plants from 50 calendar days to up to 200 days. The conclusion reached on examination of the given data is that (1) Alaska has a potentially dangerous pollution problem, and (2) great amounts of fish waste are being dumped into Alaskan waters which should be of use in the industry which reduces fish waste to meal. A paramount problem is the great distances between primary production points. Possible solutions to the problem include the establishment of a collection system serving the various production centers, necessitating the provision of a storage system to handle the build-up of waste. A variation of the plan calls for primary reduction centers at each of the processing sites. The plan is being studied, and although it has advantages, there are many problems to be worked out. The most probable method would be chemical reduction of the waste to a thick type of slurry, which then could be stored in oil tanks for eventual pumping into the barges or vessels, if the difficulties can be overcome. (Lowry-Texas)
W71-09551

THE APPLICATION OF BACTERIAL PROCESS KINETICS IN STREAM SIMULATION AND STREAM ANALYSIS,
Georgia Inst. of Tech., Atlanta.
For primary bibliographic entry see Field 05G.
W71-09553

LABORATORY AND MATHEMATICAL SIMULATION OF OXYGEN BALANCES EFFECTED IN STREAMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 05G.
W71-09554

PRECIPITATION OF PHOSPHATES FROM WATER WITH FERROUS SALTS,
Ohio State Univ., Columbus. Dept. of Chemical Engineering.
Karl Svank.
Available from the National Technical Information Service as PB-200 822, \$3.00 in paper copy, \$0.95 in microfiche. Water Resources Center, Ohio State University, Columbus, Project Completion Report 347X, February, 1971, 150 p, 59 fig, 8 tab, 22 ref. OWRP Project A-011-OHIO (2).

Descriptors: *Phosphate removal, *Phosphates, Dissolved oxygen, *Chemical precipitation, Sedimentation, Flotation, Effluents, Sewage, Activated sludge, *Waste water treatment.

Identifiers: *Ferrous sulfate.

The use of ferrous sulfate for precipitating phosphate from water was investigated. Different phosphate containing solutions were evaluated: (1) pure orthophosphate, (2) secondary effluent from a waste treatment plant, and (3) precipitation of phosphate in a simulated activated sludge process. Determinations were made of the effect of dissolved oxygen concentration, pH, and iron-to-phosphate ratio on the removal of phosphate. The relative effectiveness of calcium hydroxide and sodium hydroxide for control of pH and the use of microflotation and dissolved air flotation for separation of the phosphate precipitate were evaluated. Maximum phosphate removal (up to 97 percent) was obtained when the pH was 7 to 8, the molar iron to phosphate ratio greater than 1.5 and dissolved oxygen concentration equal to that required for complete oxidation of ferrous iron. Calcium hydroxide was found to be a more effective base since the optimal pH range was expanded and the coagulation and flocculation of the insolubilized phosphates were improved. Interferences from organic matter in secondary effluents on flotation operations were observed. Ferrous sulfate should be very effective for removing phosphate in the activated sludge process. The low dissolved oxygen concentration will control the oxidation of ferrous iron to optimal rates, and the sludge will increase the settling rate of the phosphate precipitate.
W71-09555

ADVANCES IN WASTEWATER TREATMENT, PILOT PLANT, POMONA, CALIFORNIA.
Federal Water Quality Administration, Washington, D.C.; and Los Angeles County Sanitation Districts, Los Angeles, Calif.

(1969) 17 p, 14 fig.

Descriptors: *Pilot plants, *Water reuse, *Tertiary treatment, *Waste water treatment, *Sewage treatment, Activated carbon, Ion exchange, Electrodialysis, Reverse osmosis, Denitrification, Adsorption, Nutrients, Nitrogen, Phosphorus, Treatment facilities, California.
Identifiers: *Pomona (Calif), Los Angeles County, Nutrients removal.

The brochure describes the advanced waste treatment facility at Pomona, California, which was funded and staffed through the cooperation of the Federal Water Quality Administration and the County Sanitation Districts of Los Angeles County. The pilot plant receives a portion of the effluent from the conventional biological treatment facilities and investigates processes, and combinations of processes, to improve the quality of the water. The Sanitation Districts are particularly interested in advanced waste treatment processes which will produce reusable water. The plant provides conventional primary sedimentation and activated sludge treatment to approximately 10 mgd of waste water. The final effluent contains 10 mg/l of suspended solids, 5 mg/l of biochemical oxygen demanding materials, 45 mg/l of chemical oxygen demanding materials and 600-700 mg/l of dissolved salts. The initial effort at the pilot plant was directed toward developing technical and economic information on the granular carbon adsorption process for removing the dissolved organic contaminants remaining in the conventionally treated waste waters. In addition to carbon adsorption, the Pomona staff is working on ion exchange, electrodialysis, reverse osmosis, mineral addition to conventional processes to enhance phosphorus removal and biological denitrification. Each of these processes is described and illustrated. Operational efficiencies and costs are given. Removal of phosphorus and nitrogen, and the associated costs, are described. (Poertner)
W71-09587

FEASIBILITY STUDY FOR GLENDALE - LOS ANGELES WATER RECLAMATION PLANT.
Engineering Science, Inc., Los Angeles, Calif; and Koebig and Koebig, Inc., Los Angeles, Calif.

March 13, 1969. 720 p, 89 fig, 123 tab, 75 ref.

Descriptors: *Water reuse, *Water pollution treatment, *Waste water, *Waste water treatment, *Water purification, *Beneficial use, *Reclaimed water, Industrial water, Planning, California.
Identifiers: *Los Angeles (Calif), *Glendale (Calif), *Water reclamation plant, *Hyperion Treatment Plant.

Continuing growth of Glendale has resulted in waste water flows which exceed the contractual capacity that Glendale possesses in the City of Los Angeles sewerage system. The cities commissioned a study, in 1968, through a joint powers agreement to investigate the feasibility of constructing a joint water reclamation plant in the Glendale area. This comprehensive and fully documented report presents conclusions that it is necessary, and technically and economically feasible, to build and operate the plant through a joint-powers agreement. The proposed plant, designed for a capacity of 20 mgd in its initial stage, is to be built in 1970. Enlargement of the plant to 35 mgd is proposed for 1987. The final stage, to be completed in 1995, will bring the capacity up to 50 mgd. The plant will be constructed on 15 acres of Glendale property that is currently a community eyesore. Waste water taken from trunk sewers will receive primary and secondary treatment. The reclaimed water will be sparkling clear and will be suitable for use in irrigation, industrial cooling, fire fighting, et cetera. Solid wastes will be removed and put back into the sewer, for processing at the Hyperion Wastewater Treatment Plant. The initial cost is estimated at \$5.60 million with the corresponding cost per acre foot estimated between \$29 and \$32. This unit cost will decrease as the plant capacity is increased, so that by the year 2025 the unit costs of the reclaimed water should be about \$19 per acre foot. Federal assistance under Public Law 660 appears promising. (Poertner)
W71-09590

RETENTION BASIN CONTROL OF COMBINED SEWER OVERFLOWS.

Springfield Sanitary District, Springfield, Illinois.
For primary bibliographic entry see Field 05G.
W71-09592

NUTRIENTS AND ALGAL REMOVAL FROM OXIDATION PONDS EFFLUENTS,

Mississippi State Univ., State College. Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 05G.
W71-09629

EFFECTS OF LIMNOLOGICAL FACTORS ON WATER TREATMENT,

Iowa Univ., Iowa City.
For primary bibliographic entry see Field 05F.
W71-09736

GROWING CORN IN GROWTH CHAMBERS WITH DIFFERENT MANURE TREATMENTS,

Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W71-09748

ALTERNATIVES FOR THE TREATMENT AND DISPOSAL OF ANIMAL WASTES,

Cornell Univ., Ithaca, N.Y. Dept. of Civil and Agricultural Engineering.
Raymond C. Loehr.
Journal Water Pollution Control Federation, Vol 43, No 4, p 668-678, 2 fig, 2 tab, 10 ref.

Descriptors: *Farm wastes, *Disposal, *Treatment, *Systems analysis, Runoff, Pollutant, Nutrients, Aerobic treatment, Anaerobic digestion, Dentrification, Nitrification, Effluents, Legal aspects, Waste water treatment, Waste disposal.
Identifiers: Options, Land disposal, Oxidation ditch, Pollutational characteristics alternatives.

The various systems for treating wastes from enclosed confined animal production operations are discussed. There is no one process or waste management system that will be adequate for all animal production operations. Aeration systems such as oxidation ditches are gaining acceptance for waste handling and treatment. It is unlikely that current liquid waste treatment systems for treating concentrated animal waste water will produce effluents that can be discharged to surface water. Land disposal is an integral part of feasible animal waste treatment systems. (Christenbury-Iowa State)
W71-09751

LIVESTOCK WASTE,

Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
E. Paul Taiganides.
In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 57-66, 1 tab.

Descriptors: *Farm wastes, *Cattle, Poultry, *By-products, Confinement pens, Water pollution effects, Odor, Organic matter, Moisture content, Runoff, Ammonia, Biochemical oxygen demand, Biological treatment, Drying.
Identifiers: *Animal production, *Coprology, Feedlots, Production efficiency, Waste properties, Population equivalent, Waste transport, Treatment processes.

A short comprehensive review is given of the changes in animal production and waste handling techniques. The transition from pasture to confinement production has met the demand for agricultural food and fiber. There has been a corresponding increase in animal waste management problems. This has given rise to what the author refers to as coprology - manure science. Current coprological technology includes knowledge of manure characteristics, transport methods, waste treatment and utilization schemes, and disposal media. Disposal must be done in such a way and at such a rate that nature will be able to assimilate it without creating environmental problems. (See also W71-09752) (White-Iowa State)
W71-09759

AGRICULTURAL BENEFITS FROM URBAN POLLUTION CONTROL,

Office of the Secretary of the Army, Washington, D.C.
John R. Shaeffer.
In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 101-107.

Descriptors: *Water pollution control, *Sewage treatment, Sewage, Benefits, Agriculture, Environment, Pollutants, Water pollution effects, Pumping, Viruses, Diseases, Fertilizers, Irrigation, Michigan costs.
Identifiers: *Environmental vision, Waste management, Treatment cells.

An environmental 'vision' is needed which encompasses the fact that the environment is a single interacting closed system, and that pollutants are potential resources out of place. Utilizing these ideas, a pilot waste water management scheme for Muskegon County, Michigan is outlined. Sewage is first pumped to the surrounding countryside where treatment calls convert the waste to an odorless clear liquid by using all the forces of nature - air, aerobic bacteria, gravity, sunlight, and time. The liquid is then used as irrigation water and the soil removes the remaining nutrients, heavy metals, and viruses. An under drainage system picks up the pure water and brings it to a stream. For 42 million

gallons of Muskegon County sewage a day, 10 thousand acres of land were needed. The costs for the new system are less than bringing the existing plants up to a secondary level of treatment. (See also W71-09752) (White-Iowa State)
W71-09764

THERMAL DISCHARGES: CHARACTERISTICS AND CHEMICAL TREATMENT OF NATURAL WATERS USED IN POWER PLANTS,

Oak Ridge National Lab., Tenn.
W. L. Marshall.
AGC Contract No. W-7405-eng-26. ORNL-4652, UC-48, UC-80, Reactor Chemistry Division, February, 1971, 12 p. 15 ref.

Descriptors: *Thermal pollution, *Powerplants, Cooling towers, Dissolved oxygen, Corrosion, Scaling, Acidity.
Identifiers: *Thermal discharges, *Chemical treatment, Natural water, Chemical composition.

The purpose of this report is to present information on the constituents of natural waters and the resultant composition of thermal discharges to the environment when these waters are used for cooling thermal powerplants. A weighted mean average of salts in all rivers has been given as 100 mg/liter. The equilibrium solubility of oxygen from an atmospheric mixture of gases at 25C and 1 atm is 8.3 mg per liter of pure water and that of nitrogen is 14.5 mg per liter. In the usual practice for the treatment of once-through water from open rivers or lakes, the gas chlorine is added as biocide about 3 times a day (shock treatment) for approximately a 30 minute period for each addition. Sodium chromate may be added to maintain from 25 to 50 ppm chromate in order to prevent corrosion of condenser surfaces and any other metal parts in the system. The compound ethylenediaminetetraacetic acid (EDTA) has been used to prevent or inhibit scale formation if the water used in cooling towers is sufficiently hard, but the relatively high cost of this substance prohibits its widespread use. Water used in closed cycle primary coolant loops of nuclear reactors should be polished to eliminate those impurities that would become radioactive. This article contains 15 references. (Upadhyaya-Vanderbilt)
W71-09782

5E. Ultimate Disposal of Wastes

POLLUTION OR PROFIT,

Arizona Univ., Tucson. Dept. of Agricultural Chemistry and Soils.
Wallace H. Fuller.
Horticulture, Vol 48, No 12, p 22-23, Dec 1970. 36.

Descriptors: *Water pollution control, Nitrates, Economics, Water reuse, Profit.
Identifiers: *Arizona Agricultural Experiment Station, Gila River, Ben G. Petrucci.

How pollutants can be used to fertilize the soil rather than contaminate water supplies is discussed. Sane disposal, can be profitable to industrialists, agriculturists, homeowners and society as a whole. (Holmes-Rutgers)
W71-09479

RESUME OF SEWERAGE AND REFUSE DISPOSAL PRACTICES OF SANITATION DISTRICTS OF LOS ANGELES COUNTY,

Los Angeles County Sanitation Districts, Los Angeles, Calif.
John D. Parkhurst.
June 1970. 11 p, 6 fig.

Descriptors: *Administration, *Environmental sanitation, *Legislation, *Sewage districts, *Sewage disposal, Sewage treatment, Solid wastes, Outlets, Sewage effluents, Sewage disposal.

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Group 5E—Ultimate Disposal of Wastes

Identifiers: *Los Angeles County Sanitation Districts.

The rapid population growth in Southern California following the first World War resulted in overloading sewage treatment facilities, especially in Los Angeles County. In 1923, the state legislature passed the County Sanitation District Act which authorized the board of supervisors of any county to organize a sanitation district with boundaries determined by geographic and topographic drainage areas, without regard to political subdivision. The primary function of such a district is to construct, operate, and maintain facilities to collect, treat and dispose of sewage and industrial wastes. The construction of local sewers and laterals and their connection to the sanitation district's systems remained the responsibility of local authorities. In 1949 the act was amended to authorize districts to provide for the disposal of solid wastes. The major reason for the success of the sanitation districts has been the power to join with other districts to own, construct, maintain, and operate joint facilities. The resume summarizes the operations and organization of the Sanitation Districts of Los Angeles County and the key agreements which have facilitated their administration. Brief descriptions are given of the sewerage systems and outfalls as well as the sewage treatment and waste water reclamation facilities of the Districts. Explanations are given of the Joint Refuse Transfer Disposal System Agreement and the Districts' policies for construction and operation of refuse transfer and disposal facilities in Los Angeles County. (Poertner)

W71-09585

DEEP OCEAN DUMPING OF BALED REFUSE.

For primary bibliographic entry see Field 06E.
W71-09704

INTRODUCTION TO OIL FIELD WATER TECHNOLOGY,

A. G. Ostroff.
Englewood Cliffs, NJ, Prentice-Hall, Inc, 1965, 412 p.

Descriptors: *Oil industry, *Injection wells, *Corrosion brine disposal, *Artificial recharge.
Identifiers: *Water pollution legislation, Water analysis, Water treatment microbiology, Filtration, Chemical feeders, Boiler and cooling water treatment.

This book provides up-to-date information on oil field water treatment techniques. It covers the chemical, physical, and biological problems encountered with these waters and their causes and correction. Various treatments are presented for injection, disposal, produced, boiler, cooling and plant waters. It deals specifically with water treatment problems encountered in production and includes considerable material on subsurface water injection and treatment. Coverage of sampling and analysis techniques is provided as well as causes of scale, corrosion, and pollution and methods for minimizing these problems. It also details microbiological problems and factors which influence bactericide selection. The book is very well illustrated and referenced. Many of the procedures and concepts are of direct interest to workers in the field of groundwater supply. (Campbell-NWWA)

W71-09721

ALTERNATIVES FOR THE TREATMENT AND DISPOSAL OF ANIMAL WASTES,

Cornell Univ., Ithaca, N.Y. Dept. of Civil and Agricultural Engineering.

For primary bibliographic entry see Field 05D.

W71-09751

1970 REPORT OF THE INTERSTATE SANITATION COMMISSION.

Interstate Sanitation Commission, New York.

For primary bibliographic entry see Field 05G.

W71-09801

5F. Water Treatment and Quality Alteration

THE ISOLATION AND CHARACTERIZATION OF SORBITOL-6-PHOSPHATE DEHYDROGENASE FROM CLOSTRIDIUM PASTEURIANUM,

National Institute for Water Research, Pretoria (South Africa).

For primary bibliographic entry see Field 05D.

W71-09547

NEW WATER DISINFECTANT: AN INSOLUBLE QUATERNARY AMMONIUM RESIN-TRIIODIDE COMBINATION THAT RELEASES BACTERICIDE ON DEMAND,

Kansas State Univ., Manhattan. Dept. of Chemistry; and Kansas State Univ., Manhattan. Div. of Microbiology.
S. L. Taylor, L. R. Fina, and J. L. Lambert.

Applied Microbiology, Vol 20, No 5, p 720-722, 1970. 2 tab, 9 ref. OWRR Project A-028-KAN (1).

Descriptors: *Bacteriocides, *Viricides, *Water purification, Anion exchange, Resins, E coli, Coliforms, Pathogenic bacteria, Streptococcus, Salmonella, Pseudomonas, Environmental sanitation, Human diseases, Water pollution effects.

Identifiers: *Triiodide ions, Salmonella typhimurium, Streptococcus fecalis, Staphylococcus aureus, Pseudomonas aeruginosa.

The introduced water disinfectant is a water insoluble compound of basic anion-exchange resins with triiodide ions. This combination proved to possess remarkable antibacterial properties killing 300,000 *Escherichia coli* cells per ml in a 3.8 g column. The bacteriocidal effect extends to *Salmonella typhimurium*, *Streptococcus faecalis*, *Staphylococcus aureus*, and *Pseudomonas aeruginosa*. The results were demonstrated by the use of C-14 labeled bacteria. The insolubility and the high capacity of the compound promise its wide application in houses, hospitals, agriculture, and cooling water systems. The exact mechanism of the bacteriocidal effects is being investigated. (Wilde-Wisconsin)

W71-09562

NEW LIFE FOR 'MINI-LAKE ERIES',

Wisconsin Dept. of Natural Resources, Madison.

Thomas L. Wirth.

Wisconsin Conservation Bulletin, Vol 36, No 2, p 7-9, March-April 1971. 3 fig.

Descriptors: *Lakes, *Water quality control, *Project planning, *Economics.

Identifiers: *Upper Great Lakes Regional Commission, Snake Lake, Horseshoe Lake, Lake Marion.

A project being conducted jointly by the University of Wisconsin and the Upper Great Lakes Regional Commission is attempting to demonstrate methods useful for restoration and protection of inland lakes. The article describes three demonstration projects focusing on the physical, economic and original aspects of each project. (Holmes-Rutgers)

W71-09693

EFFECTS OF LIMNOLOGICAL FACTORS ON WATER TREATMENT,

Iowa Univ., Iowa City.

Donald B. McDonald, and Neil B. Fisher.

Available from the National Technical Information Service as PB-201 000, \$3.00 in paper copy, \$0.95 in microfiche. Completion Report ISWRRI-32, Iowa State Water Resources Research Institute, April 1971, 9 p, 2 tab, 4 ref. OWRR Project A-028-IA (4).

Descriptors: Limnology, *Water treatment, Turbidity, Lignins, Chlorine, Biochemical oxygen demand, Iowa.

Identifiers: Coralville Reservoir, Clear Creek, Threshold odor, Tannis.

Comparisons between previously determined Coralville Reservoir conditions and water plant operations indicate that various limnological conditions are frequently accompanied by specific treatment problems at the University of Iowa Water Treatment Plant. In general, it appears that three periods of high odor values occur annually, during summer and early fall, during late winter and early spring and during early winter. It appears that the operation of the Coralville Reservoir as a flood control structure has a significant effect on limnological conditions within the impoundment and the downstream river. Preliminary comparisons indicate that extended periods of static water level or rapid drawdown may result in increased taste and odor problem at the Water Plant. Laboratory studies were undertaken using a synthesized water and running jar tests to determine what treatment process modifications would be beneficial during critical periods. From experimental runs using five different types of activated carbon it was found that a reduction in the parameters of ammonia, tannin, and taste and odor was accomplished. No other type of carbon was more satisfactory in removing these parameters than the activated carbon normally used in water treatment. Normally used activated carbon gave best removal at 70 ppm. When the water was chlorinated a taste and odor developed that made the water unsatisfactory.

W71-09736

ALTERNATIVE OXYGENATION POSSIBILITIES FOR LARGE POLLUTED RIVERS,

Putgero-The State Univ., New Brunswick, N.J. Water Resources Research Inst.

For primary bibliographic entry see Field 05G.

W71-09821

PUBLIC WATER SUPPLY SYSTEMS.

American Water Works Association, New York.

For primary bibliographic entry see Field 03D.

W71-09867

5G. Water Quality Control

POWERS OF CITIES: WATER MANAGEMENT AND POLLUTION CONTROL.

For primary bibliographic entry see Field 06E.

W71-09520

A REVIEW OF THE LITERATURE OF 1968 ON WASTEWATER AND WATER POLLUTION CONTROL - INDUSTRIAL WASTE, RADIOACTIVE,

C. P. Straub.

Journal Water Pollution Control Federation, Vol 41, 1223-1251, June 1969.

Descriptors: *Industrial wastes, *Water, *Control, *Water Quality control, *Water pollution, Water pollution control, Water treatment, Chemical precipitation, Ion exchange, Solvent extractions, Adsorption, Absorption, Electrodialysis, Waste disposal, Oceans, Rivers, Sedimentation, Monitoring, Analytical technique.

Identifiers: Radioactive wastes, Decontamination, Waste management.

The following topics relating to radioactive industrial waste disposal were reviewed (with 167 references): U recovery, waste water treatment by precipitation of radionuclides, solvent extraction, ion exchange, adsorption, uptake on natural materials, electrodialysis, and fixation; ground disposal; disposal in the hydrosphere (oceans, rivers); uptake on sediments; monitoring; and analysis. In the United States increased emphasis is placed on concentrating, solidifying, and containing wastes. Only a nonhazardous, economically irreducible minimum of radioactive material is to be discharged to the environment. Waste management practice at nuclear power plants operates within the limits authorized for release of radioactive wastes to the environment at costs estimated to range between 2 and 10% of their total operating

costs. The average activity in liquid wastes varies from 0.01 to 11.1 Ci, exclusive of ³H. Tritium levels range from 5 to 1300 Ci annually. Use of high-pressure washing and rewashing for leaching U from mined-out areas is referred to. Removal of specific radionuclides by various treatments of waste water is outlined. The presence of detergents affects the treatment of wastes by precipitation; the effect is increased at increased detergent concentrations and generally increases with decreased pH. How ⁹⁰Sr is extracted from various radioactive waste solutions at the Hanford B plant is explained. A study to determine if low-cost nuclear energy, heat, radiation, or electricity could be used to reduce the cost of waste water treatment is reviewed. (Houser-NSIC)
W71-09521

THE ANATOMY OF AN IN-TRANSIT SPILL,
Monsanto Co., St. Louis, Mo. Industrial Hygiene and Pollution Control.
Jack T. Garrett.
Journal Water Pollution Control Federation, Vol 43, No 5, May 1971, p 773-778.

Descriptors: *Transportation, *Accidents, *Water pollution control, Neutralization, Biodegradation, Solubility, Toxicity, Hydrogen ion concentration, Sampling, Public health, *Hazards, Water pollution control.

In-transit spills of manufactured products which are being moved overland by truck or train are many times potential contributors to water pollution in the area of the spill. In the past, little notice has been made of this fact, with the primary concern being with the danger of fire, explosion, or direct contact with corrosive materials by individuals in the immediate area. The characteristics needed to evaluate the fire, explosion, or contact danger are generally readily available, whereas the pollutional potential characteristics are not. The characteristics most necessary to evaluate the pollutional potential of a spill are: (1) solubility in water; (2) toxicity to fish and other aquatic life; (3) specific gravity; (4) the effect of neutralizing solvents on the solubility in water, toxicity, and pH of the receiving stream; (5) treatment chemicals, if any, that can reduce the pollution effects; (6) biodegradability; and (7) any other information which may be pertinent. The key to an operation of this type is speed, necessitating development of an information system which will provide ready access to plant officials, pollution control agencies, and law enforcement officials. A small beginning has been made by the National Agricultural Chemists Association, The Manufacturing Chemists Association, and the American Petroleum Institute in working on the problem of information availability for accident use by transportation companies, and local, state, and federal agencies. (Lowry-Texas)
W71-09540

THE OCCURRENCE OF FUNGI IN ACID-MINE DRAINAGE,
Federal Water Pollution Control Administration, Cincinnati, Ohio.
William B. Cooke.
Proceedings, Industrial Waste Conference, 21, Vol L, No 2, Mar 1966, p 258-274, 5 tab, 18 ref.

Descriptors: *Fungi, *Mine drainage, Iron, Hydrogen ion concentration, Laboratory tests, Microbiology, Cultures, Bacteria, Yeasts, Molds, Carbon, Nutrients, Sediment, Habitat, Acclimatization, Tributaries, Summer, Fall, Winter, Water analysis, West Virginia, Ohio, Water pollution control.
Identifiers: Ohio River System.

Problems arising from pollution resulting from acid mine drainage have been recognized in the United States since 1902. The role of fungi in this field has, however, been largely ignored until recently. A new phase of study was begun in 1964 when tributaries of the Ohio River were studied at three points in Ohio and West Virginia which varied in the

amount of pollution found. Samples were taken in spring, fall, and winter from the stream bed, the stream, the creek bank at the water level, and the creek bank at a point where water reached the soil only during severe flood conditions. Colonies which resulted in the sample cultures yielded 202 species and species groups. No study of the role of these species in mine-drainage could be made at that time. Studies which were made showed that fungi were exposed to high degrees of acidity and large amounts of iron compounds. Other studies have shown that fungi can readily adapt to a wide variety of habitat factors. Some species are thought possibly helpful in the removal of organic pollutants from water and may at the same time be involved in the production of organically stabilized colloidal iron. True fungi do not seem directly involved in transformations leading to the type of pollution referred to as 'acid-mine drainage' or to be involved in lowering the acidity of their environment. (Lowry-Texas)
W71-09541

THE ECONOMICS OF REGIONAL POLLUTION CONTROL SYSTEMS,
Michigan Univ., Ann Arbor. Dept. of Environmental Health.
For primary bibliographic entry see Field 05D.
W71-09544

POLLUTION CONTROL FOR MINING AND PROCESSING OF INDIANA COAL,
Indiana State Board of Health, Indianapolis.
Richard A. Woodley, and Samuel L. Moore.
Proceedings, Industrial Waste Conference, 20, Vol XLIX, No 4, p 265-274, 4 fig, 8 ref.

Descriptors: *Coal mine wastes, *Mine drainage, Strip mine, Underground mining, Land reclamation, Revegetation, Water reuse, Hydrogen ion concentration, Alkalinity, Diversion structures, Excavation, Overburden, Slurries, Sediments, Waste water treatment, Industrial wastes, Indiana.
Identifiers: Coal fines, Clarification ponds, Processing plant.

The Indiana Stream Pollution Control Law of 1943, created the Indiana Stream Pollution Control Board which has control over the pollution of any waters in the state. Indiana mine owners are required to dispose of refuse from processing coal in a manner which will create minimal acid mine drainage and deposits of coal fines. A stream is considered polluted if it has a pH of less than 6.0, alkalinity of less than 50 mg/l and coal fine deposits. Two of the major problems are surface mine drainage control and processing plant pollution control. Underground mine drainage control is also a problem, but is not very serious because of the small number of underground mines in Indiana. Devices such as diversion ditches for surface streams, pumps for conveying precipitation and infiltration from the excavation and deposit of acid producing material in excavations which will be filled with cast overburden are used to prevent pollution of other waters with acid or coal. Flooding, grading to approximate original contour, and revegetation procedures are also used. Care must be taken, too, that coal haulage roads are not made of acid-producing materials. Should this occur, soil or limestone is used to cover the road. Pollution from coal processing is handled by clarification ponds to settle out coal fines in the wash water. Processing refuse is taken to excavations of surface mines and covered. Refuse at underground mines is placed where it can be covered most easily. A closed system in which drainage from the clarification pond and refuse disposal site is combined, treated, and reused for wash water at the processing plant. (Lowry-Texas)
W71-09549

STUDY RELATING TO ENVIRONMENTAL POLLUTION.
For primary bibliographic entry see Field 06E.
W71-09552

THE APPLICATION OF BACTERIAL PROCESS KINETICS IN STREAM SIMULATION AND STREAM ANALYSIS,
Georgia Inst. of Tech., Atlanta.
W. E. Gates, J. T. Marlar, and J. D. Westfield.
Water Research, Vol 3, 1969, p 663-686, 14 fig, 1 tab, 14 ref. OWRR Research Report No A-003-GA (6).

Descriptors: *Hydrogen sulfide, *Foam fractionation, Catalysts, Surfactants, Separation techniques, Oxidation, Filtration, Precipitation (Chemical), Economic feasibility, Technical feasibility, Cost analysis, Water purification, Waste water treatment, Water pollution control.
Identifiers: *Residual.

Three surfactant and surfactant-catalyst systems were studied to determine their feasibility for removal of H₂S from sour water, and the recovery of elemental sulfur. The surfactants chosen for study were those known to be capable of forming intermediates in the oxidation in the presence of oxygen, of H₂S to sulfur. The surfactants generated a stable foam which was removed and collected. The precipitated sulfur was removed by filtering the foamate. The surfactant was then recycled to the process and re-used. These systems were shown to be capable of reducing the hydrogen sulfide to less than .1 ppm while leaving 40 to 80 ppm of residual surfactant in the effluent. The residual surfactant, since the surfactant used were all biodegradable, presented no hazard to receiving waters, but cost of replacement of the amount lost was excessive. Maximum sulfur recovery was 16% by weight, under the conditions of the investigation. Under the best possible operating conditions (16wt % sulfur recovery and 40 ppm surfactant in effluent), the operating expense was determined to be 3.5 mil/bbl of (200 ppm H₂S) sour water treated. (See also W71-09554) (Lowry-Texas)
W71-09553

LABORATORY AND MATHEMATICAL SIMULATION OF OXYGEN BALANCES EFFECTED IN STREAMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
William E. Gates.
Available from the National Technical Information Service as PB-200 821, \$3.00 in paper copy, \$0.95 in microfiche. Environmental Resources Center, Georgia Institute of Technology, ERC-0171, April 1971. 52 p, 23 fig, 8 ref. OWRR Project A-003-GA (8).

Descriptors: *Stream analysis, *Waste assimilative capacity, *Oxygen sag, *Wager quality control, *Waste water treatment, Dissolved oxygen, Chemical oxygen demand, Bio-Kinetics, Aquatic bacteria, Water pollution effects, Waste management.
Identifiers: *Streeter-Phelps Equation, *Monod Equations.

The project objective was to develop methodology for evaluating and predicting the impact which various parameters and components of waste water have on the dynamic oxygen balance in a receiving water. Dynamic oxygen balances obtained under a variety of oxygenation and deoxygenation conditions were studied in the laboratory using batch reactors and in the field using natural streams. The Streeter-Phelps expression for the mathematical description of oxygen sag curves was found inaccurate due to inclusion of the first order expression for describing substrate utilization by bacteria. Monod Equations were found valid for defining bacterial substrate utilization and protozoa bacterial utilization. Substrate utilization as determined by the COD test was found to be dependent on the time frame for sampling. It was found that the shorter the time frame, the greater the variances and apparent inconsistencies in the data. Techniques were developed for determining Monod Equation constants using batch reactor data and data obtained under continuous dilution in a natural stream. In general, the studies indicate that laboratory evaluation of the impact of alternative methods of water resources management on

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the oxygen resources of the receiving stream is valid. (See also W71-09553) (Conway-Georgia Tech)
W71-09554

FINANCIAL RESPONSIBILITY FOR OIL POLLUTION CLEANUP.

Federal Maritime Commission, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-09564

WATER RELATED ENVIRONMENTAL SERVICES.

Central New York Regional Planning and Development Board, Syracuse.
For primary bibliographic entry see Field 06B.
W71-09572

BAY-DELTA WATER QUALITY SUBCOMMITTEE PRELIMINARY REPORT.

Sierra Club, San Francisco, Calif., San Francisco Bay Chapters.
For primary bibliographic entry see Field 06G.
W71-09578

EFFECTS OF PLANNED FRESH WATER DIVERSIONS ON THE SAN FRANCISCO BAY AND SACRAMENT—SAN JOAQUIN ESTUARY, California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06G.
W71-09581

STATEMENT OF THE BOARD OF SUPERVISORS OF CONTRA COSTA COUNTY, REGARDING EFFECT OF REDUCED OUTFLOW UPON THE SAN FRANCISCO BAY-SACRAMENTO-SAN JOAQUIN DELTA ESTUARINE SYSTEM.

Board of Supervisors of Contra Costa County, Martinez, Calif.
For primary bibliographic entry see Field 06G.
W71-09584

RETENTION BASIN CONTROL OF COMBINED SEWER OVERFLOWS.

Springfield Sanitary District, Springfield, Illinois.

Copy available from GPO Sup Doc as , \$1.00; microfiche from NTIS as PB-200 828, \$0.95. Environmental Protection Agency, Water Quality Office, Water Pollution Control Research Series 11023—08/70, August 1970. 97 p, 37 fig, 4 tab, 8 ref. EPA-WQO Grant 3-111-1.

Descriptors: *Water pollution control, *Settling basins, *Surface runoff, *Storm runoff, *Waste water disposal, Drainage water, Stream improvement, Fishkill.
Identifiers: *Combined sewer overflows, *Retention basins.

The Springfield Sanitary District constructed a 10 acre basin to collect and detain combined sewer overflows that bypass the Cook Street Pumping Station during periods of high volume flow. Surface runoff accompanying rainstorms cause high volume flows which are diverted into the Cook Street Channel. Such flows introduce highly toxic pollution loads into Sugar Creek and the South Fork of the Sangamon River. The retention basin was built to intercept these flows so that they could be stored temporarily and released at low flow rates into Sugar Creek to avoid shock pollution of the stream. Historically, the high concentrations of pollutants discharged into Sugar Creek have caused serious fishkill. The retention basin was designed to retain water to a depth of four feet before it discharges captured runoff through a spillway provided with a notched weir. Average annual reduction of BOD was 27 percent and coliform reduction averaged 72 percent. However during the period from June through October 1969, production of algae in the basin caused the effluent BOD to con-

sistently exceed that of the influent. In addition to the oxygen demand on the stream, production of algae may be objectionable at some installations for aesthetic reasons. Sludge accumulation was significant in the basin and must be taken into account in design of similar facilities. Suggestions for future designs of retention basins are included. (Poertner)
W71-09592

PROCEEDINGS, MISSISSIPPI WATER RESOURCES CONFERENCE, 1971.

Mississippi State Univ., State College. Water Resources Research Inst.

Available from the National Technical Information Service as PB-200 829, \$3.00 in paper copy, \$0.95 in microfiche. Conference held April 13-14, 1971, Vicksburg, Water Resources Research Institute, Mississippi State University, 1971. 80 p. OWRR Project A-999-MISS (7).

Descriptors: *Water resources development, *Mississippi, *Conferences, *Water resources research act, Reservoirs, Water quality, Monitoring, Navigation, Waste water treatment, Water management (Applied).
Identifiers: *Mississippi Water Resources Conference (1971).

The sixth Mississippi Water Resources Conference was held in Vicksburg on 13-14 April for the purpose of exchanging information pertaining to water resources. Topics discussed include nutrients and algal removal from oxidation ponds effluents, chlorinated hydrocarbon insecticide contamination of streambed sediments in the Mississippi River delta, effects of turbidity on forest recreation potentials, economic determinants for sediment management on a north Mississippi watershed, water management implications in the south's third forest, restoration and development of the port of gulfport, establishment of an automatic water quality surveillance program, and water resource problems and opportunities associated with multiple-purpose impoundments. (See also W71-09629 thru W71-09634) (Knapp-USGS)
W71-09628

NUTRIENTS AND ALGAL REMOVAL FROM OXIDATION PONDS EFFLUENTS,

Mississippi State Univ., State College. Dept. of Sanitary Engineering.
Adnan Shindala.

Conference held April 13-14, 1971, Vicksburg, Water Resources Research Institute, Mississippi State University, p 1-7, 1971. 7 p, 1 fig, 1 tab, 3 ref.

Descriptors: *Algae, *Waste water treatment, *Tertiary treatment, *Coagulation, *Oxidation lagoons, Aerobic treatment, Oxidation, Organic matter.
Identifiers: Nutrient removal.

Chemical coagulation is an effective post treatment process for algal removal and for improving the quality of effluents from stabilization ponds. Of the coagulants tested, alum was the best. The optimum dosage for best removal of the parameters studied was in the range of 75 to 100 mg/liter. Using this dosage, the supernatant from the chemical coagulation process was found to contain 2.5 mg/liter BOD, 22.9 mg/liter COD, 1.5 mg/liter total phosphates, 3.5 mg/liter total phosphates, 3.5 mg/liter total nitrogen, 500 to 1000 algal cells/ml and approximately 5,000 coliforms/100 ml. The algae in the pond effluents contribute heavily to the BOD, COD, and nitrogen in the effluent, while the contribution to the phosphates concentration was less important. (See also W71-09628) (Knapp-USGS)
W71-09629

CHLORINATED HYDROCARBON INSECTICIDE CONTAMINATION OF STREAMBED

SEDIMENTS IN THE MISSISSIPPI RIVER DELTA,

Agricultural Research Service, Oxford, Miss. Sedimentation Lab.

L. L. McDowell, E. H. Grissinger, G. C. Bolton, D. A. Parsons, and W. F. Barthel.

Conference held April 13-14, 1971, Vicksburg, Water Resources Research Institute, Mississippi State University, p 9-21, 1971. 13 p, 5 fig, 2 tab, 3 ref.

Descriptors: *Mississippi, *Path of pollutants, *Chlorinated hydrocarbon pesticides, *Mississippi River, *Bottom sediments, Water pollution sources, Farm wastes, Industrial wastes.
Identifiers: *Mississippi Delta.

The large amounts of chlorinated hydrocarbon insecticides previously applied to crops in the Mississippi River Delta have not created widespread, chronic contamination of the streambed sediments in the Mississippi River (detectable at 0.01 ppm). On the tributaries, with one exception, DDT analogs and metabolites were the only residues originating from agricultural or urban sources. Significant contamination resulted from manufacturing operations in the Wolf River-Cypress Creek complex at Memphis, Tenn., and from a group of pesticide formulating plants in Mississippi. Concentrations of individual pesticides ranged from non-detectable to 24,000 ppm. (See also W71-09628) (Knapp-USGS)
W71-09630

EFFECTS OF TURBIDITY ON FOREST RECREATION POTENTIALS,

Forest Service (USDA), Jackson, Miss.

Robert J. Lentz.

Conference held April 13-14, 1971, Vicksburg, Water Resources Research Institute, Mississippi State University, p 23-28, 1971. 6 p, 2 tab, 9 ref.

Descriptors: *Water quality, *Recreation, *Turbidity, *Planning, Swimming, Fishing, Boating, Water pollution sources, Water pollution effects, Erosion, Erosion control, Forests.
Identifiers: Forest recreation.

Clear water is essential for a quality recreation experience and is highly desirable from the standpoint of visual appeal, recreation enjoyment, and safety. Recreational development plans must consider environmental influences and be flexible to compensate for unforeseen contingencies. Turbidity has a detrimental physiological and psychological effect on recreation users, and users affect water quality. Proper planning is essential to insure the best type of environment for a quality recreation experience. (See also W71-09628) (Knapp-USGS)
W71-09631

ECONOMIC DETERMINANTS FOR SEDIMENT MANAGEMENT ON A NORTH MISSISSIPPI WATERSHED,

Economic Research Service, Oxford, Miss. Natural Resource Economics Div.
Harold R. Cosper.

Conference held April 13-14, 1971, Vicksburg, Water Resources Research Institute, Mississippi State University, p 29-40, 1971. 12 p, 1 fig, 4 tab.

Descriptors: *Sediment control, *Cost-benefit analysis, *Economics, *Mississippi, Forest management, Channel improvement, Check structures, Dam construction, Silting, Soil erosion, Erosion control.
Identifiers: Pigeon Roost Creek (Miss).

Studies pertaining to economic and physical relationships within a watershed acre conducted on a 117-square-mile section of the Pigeon Roost Creek Watershed in North Mississippi. The principal emphasis for management and control of sediment in the Pigeon Roost Creek Watershed of North Mississippi was on retaining the sediment on the watershed. This was done by artificial barriers to trap and retain the sediment, and land use changes

to reduce and prevent further soil losses off the watershed. The necessary economic determinants required to assess economic efficiency include not only the direct capital investments but also any economic adjustments in the farming enterprise. Average total direct capital cost was \$8.95 per watershed acre for the 74,900 acres. Sediment-retarding structures accounted for \$4.61 per acre, and the reforestation program for \$4.34. The increase in forested acres was not an economic cost because this land had previously been idle. Also, there were no economic adjustments made on cultivated lands to specifically accommodate sediment management. (See also W71-09628) (Knapp-USGS)
W71-09632

WATER RESOURCES PROBLEMS AND OPPORTUNITIES ASSOCIATED WITH MULTIPLE-PURPOSE IMPOUNDMENTS,
John P. Burt.
Conference held April 13-14, 1971, Vicksburg, Water Resources Research Institute, Mississippi State University, p 75-80, 1971. 6 p.

Descriptors: *Water resources development, *Water quality, *Planning, *Water quality control, *Mississippi, Reviews, Water storage, Multiple-purpose reservoirs.

Some of the problems associated with developing impoundments for water supply and recreational water contact sports in addition to other water use purposes are reviewed. The criteria for these two purposes are more stringent than for other water use purposes and were used to illustrate the water resources problems. Usually, no water quality criteria problems are associated with purposes of flood storage, storage for flow augmentation or irrigation unless unusual circumstances exist in the drainage area. (See also W71-09628) (Knapp-USGS)
W71-09633

ESTABLISHMENT OF AN AUTOMATIC WATER QUALITY SURVEILLANCE PROGRAM,
Corps of Engineers, Mobile, Ala. Environmental Quality Section.
Nathaniel D. McClure, IV.
Conference held April 13-14, 1971, Vicksburg, Water Resources Research Institute, Mississippi State University, p 67-74, 1971. 8 p, 13 ref.

Descriptors: *Water quality, *Monitoring, *Mississippi, *Water resources development, Dissolved oxygen, Water temperature, Hydrogen ion concentration, Electrical conductance, Turbidity, Reservoirs, Canals.
Identifiers: *Water quality monitoring.

In an attempt to obtain information about the effect existing water resource developments in Mississippi and Alabama have on water quality, an Automatic Water Quality Surveillance Program was developed. The basic component of this program is the continuous water quality monitor. Five parameters are monitored: temperature, dissolved oxygen, pH, specific conductivity and turbidity. A paper tape punch was chosen for data recording because of its capability of directly interfacing with automatic data processing techniques. A computer program was developed to reduce the data to a more interpretable form. The weekly checkout of the remote station involves cleaning of the sample chamber, examining all sensors, adding of electrolyte to the D.O. and pH probes as necessary and a calibration check of three parameters. (See also W71-09628) (Knapp-USGS)
W71-09634

UNITED STATES V VULCAN MATERIALS CO (POLLUTION PROSECUTION UNDER THE NEW YORK HARBOR ACT).
For primary bibliographic entry see Field 06E.
W71-09660

ESTABLISHING THE ENVIRONMENTAL QUALITY COUNCIL AND THE CITIZENS ADVISORY COMMITTEE ON ENVIRONMENTAL QUALITY,
For primary bibliographic entry see Field 06E.
W71-09663

SEWDISH SCIENCE: SAYING WHAT SHOULD BE DONE,
Lund Univ. (Sweden).
Andrew Jamison.
Technology Review, Vol 73, No 6, p 12 and 13, April 1971.

Descriptors: *Water pollution control, *Lake restoration, Economic feasibility, Decision-making.
Identifiers: *Sweden, Lake HornBorga, Lake Trummen, Vaxjo.

Swedish limnologists have begun to work directly with industry and government to restore polluted lakes. The lake restoration projects mentioned in this article are examples of scientists promoting change and proposing pollution control schemes to affect environmental improvement. The author questions whether these examples are more than unique and will actually serve as a model for scientific contributions to the environmental policy in Sweden. (Holmes-Rutgers)
W71-09686

HOW SWEDEN TACKLES POLLUTION,
Lund Univ. (Sweden).
Andrew Jamison.
New Scientist and Science Journal, Vol 49, No 737, p 234-236, Feb 4, 1971.

Descriptors: *Water pollution control, *Policy planning, *Lake restoration, Industrial water.
Identifiers: *Sweden, Royal Swedish Environmental Protection Board, Lake Trumman.

Sweden has developed an efficient system for dealing with environmental pollution as illustrated in this article with examples of water pollution control. However, some Swedish scientists advocate a more comprehensive effort at planning in an ecological way for the future development of the country, instead of tackling each pollution crisis as it occurs. (Holmes-Rutgers)
W71-09687

INTERSTATE SANITATION COMMISSION--POWERS.
For primary bibliographic entry see Field 06E.
W71-09688

USE OF CHEMICALS, MATERIALS OR TECHNIQUES TO TREAT OIL SPILLS (MASSACHUSETTS POLICY STATEMENT).
Massachusetts Div. of Water Pollution Control, Boston.
For primary bibliographic entry see Field 06E.
W71-09689

SOLID STATE BREAKTHROUGHS IN WATER AND WASTE CONCEPTS,
Autocon Industries, St. Paul, Minn.
R. W. Brown.
Journal of the New England Water Works Association, Vol 84, No 3, p 253-261, Sept 1970. 5 fig.

Descriptors: *Water pollution control, Comparative costs, *Water treatment, *Waterworks.
Identifiers: *Autocon Auto-Mod system.

This article describes the usefulness of solid state components in water and water treatment systems. These components provide reliability, flexibility, serviceability, and the ability to design systems for maximum utilization for the minimum investment. (Holmes-Rutgers)
W71-09691

AD VALOREM TAX EXEMPTION FOR ANTI-POLLUTION DEVICES, SYSTEMS AND FACILITIES.
For primary bibliographic entry see Field 06E.
W71-09692

STATE CERTIFICATION OF ACTIVITIES REQUIRING FEDERAL LICENSE OR PERMIT.
For primary bibliographic entry see Field 06E.
W71-09698

CERTIFICATION OF FACILITIES FOR WATER POLLUTION CONTROL.
For primary bibliographic entry see Field 06E.
W71-09699

CONTROL OF POLLUTION BY OIL AND HAZARDOUS SUBSTANCES, DISCHARGE REMOVAL.
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-09701

A BILL TO CONSENT TO THE INTERSTATE ENVIRONMENT COMPACT.
For primary bibliographic entry see Field 06E.
W71-09702

GREAT LAKES BASIN CONSERVATION ACT (A BILL TO AMEND THE SOIL CONSERVATION AND DOMESTIC ALLOTMENT ACT TO PROVIDE FOR A GREAT LAKES BASIN CONSERVATION PROGRAM).
For primary bibliographic entry see Field 06E.
W71-09703

STATE CERTIFICATION OF ACTIVITIES REQUIRING A FEDERAL LICENSE OR PERMIT.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-09705

CLEAN WATERS FOR AMERICA WEEK, 1971,
For primary bibliographic entry see Field 06E.
W71-09706

BASS ANGLER SPORTSMAN SOC'Y V UNITED STATES STEEL CORP (PRIVATE PARTY LACKS RIGHT TO ENFORCE ANTI-POLLUTION PROVISIONS OF RIVERS AND HARBORS ACT).
For primary bibliographic entry see Field 06E.
W71-09707

TOWARD A CONSTITUTIONALLY PROTECTED ENVIRONMENT.
For primary bibliographic entry see Field 06E.
W71-09709

STOCHASTIC POPULATION DYNAMICS FOR REGIONAL WATER SUPPLY AND WASTE MANAGEMENT DECISION-MAKING,
Massachusetts Univ., Amherst.
Peter Meier.
Water Resources Research, Technical Report No EVE 25-70-5, August 1970. 207 p, 37 fig, 22 tab, 105 ref, 5 append. OWRR Project B-011-MASS (4).

Descriptors: *Regional analysis, *Water management, *Input-output analysis, *Population, Dynamics stochastic processes, Optimization.

A methodology for local area population projection and water and sewer service area prediction was developed. The projection model consisted of a stochastic simulation of interregional population growth and a finite-difference solution to a non-

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linear differential equation describing spatial variations in urban population densities. The projection model output was designed as input to optimization algorithms for region-water supply and waste treatment facilities. The components of demographic change were modeled as autoregressive stochastic processes, and a response surface algorithm was developed to decompose net migration rates into in- and outmigration rates. Service area prediction was based on a computerized evaluation of the distance-density relations at the existing service area periphery. Comparison of results to preliminary 1970 census figures indicated a superior prediction performance over traditional methods of population projection as practiced by consulting engineers and planners. (Veverka-Cornell)
W71-09741

MANAGEMENT OF WATER QUALITY IN RELEASES FROM SOUTHWESTERN IMPOUNDMENTS,
Texas Univ., Austin. Environmental Health Engineering Program.
For primary bibliographic entry see Field 04A.
W71-09742

SELECTIVE WITHDRAWAL AS A WATER QUALITY MANAGEMENT TOOL FOR SOUTHWESTERN IMPOUNDMENTS,
Texas Univ., Austin. Environmental Health Engineering Program.
For primary bibliographic entry see Field 04A.
W71-09743

REGULATIONS PERTAINING TO ISSUANCE OF A PERMIT.
Missouri Water Pollution Board.
For primary bibliographic entry see Field 06E.
W71-09744

A DOSING SIPHON FOR DISCHARGING CLEANING WATER INTO FLUSHING GUTTERS,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
H. L. Person, and J. R. Miner.
Unpublished paper presented at the 1971 Mid-Central Region Meeting American Society of Agricultural Engineers. Paper No MC-71-105, 22 p, 10 fig, 3 ref.

Descriptors: *Farm wastes, Design data, Equipment, Confinement pens, Test procedures, Theoretical analysis, Water pollution control.
Identifiers: *Flushing gutter, *Dosing siphon, Waste removal, Sniffer.

An automatic dosing siphon has been designed, built, and used for discharging water into flushing gutters. An explanation of how the device operates as well as test data and design information are presented. The automatic dosing siphon is easy to design and build. The parts are commercially available. If proper precautions are taken to ensure that all joints are airtight, the automatic dosing siphon is a dependable device for discharging cleaning water into flushing gutters. (Christenburg-Iowa State)
W71-09747

ECONOMICS OF POLLUTION CONTROL,
Iowa State Univ., Ames. Dept. of Economics.
John F. Timmons.
In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 77-85.

Descriptors: *Environment, *Water pollution control, Economics, Natural resources, Standards, Programs, Costs, Benefits, Watersheds, Agriculture, Water pollution effects.
Identifiers: *Environmental quality, Goals, Quality standard, Suspended sediment, Production costs.

The paper suggests some ideas and methods that appear useful in understanding and in resolving some of the difficult but important issues emanating from three environmental quality questions. First, what are the standards of environmental quality that can serve as policy and program goals and at the same time engender wide spread and continuing public understanding and support. Next, what are the costs, both monetized and non-monetized, of both achieving and failure to achieve the stated standards of environmental quality. Thirdly, who pays the costs both with and without achievement of the standards of environmental quality and who gets the benefits. Since environmental quality is a national issue, the author has endeavored to identify and elaborate upon these three major considerations in our quest for improvements in the quality of the natural environment. (See also W71-09752) (White-Iowa State)
W71-09761

CURRENT CONSERVANCY LEGISLATION,
Iowa House of Representatives, Des Moines.
Dale M. Cochran.
In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 87-93.

Descriptors: *Soil conservation, *Legislation, Wind erosion, Drainage, Soil erosion, Water pollution effects, Sediment, Rivers, Fertilizers, Pesticides, Agriculture, Iowa.
Identifiers: *Conservancy Districts, Des Moines River, District soil commissioners, Non-farm sources, US Department of Agriculture.

The scope and content of Iowa's Conservancy District bill is explained in this paper. The bill resulted after a review and study of drainage laws indicated that flood control, water pollution, recreation, soil erosion, and others were closely related. Conservation efforts have become rather static for a number of reasons, among them apathy, large operators, and shifts to continuous row crops. The Conservancy bill, as proposed, would regulate farm and non-farm sources of erosion both by wind and water. The local soil conservation district commissioners would be in charge of soil conservation compliance. Cost sharing would be available for those required to comply. Failure to comply could result in a court order requiring immediate compliance and loss of any cost sharing funds that might have been available. (See also W71-09752) (White-Iowa State)
W71-09762

POLLUTION CONTROL DECISIONS - WHO SHOULD MAKE THEM,
Resources for the Future, Inc., Washington, D.C.
Edwin T. Haeefe.
In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 95-99.

Descriptors: *Water pollution control, *Pollution abatement, Governments, Legislation, Environment, Taxes, Water pollution effects, *Decision making.
Identifiers: Individual rights, Executive responsibility.

Four lessons have been learned in the developing history of our country to the problems of pollution control. The first lesson is the necessity for legislative determination of policy. Most environmental issues are not problems that can be solved but conflicts that must be resolved. Individual rights is the second lesson. All of us are exercising our individual rights to the detriment of all of us. Rightful use by each individual is the central core of the problem of over use of common property resources. The need for executive responsibility is the third lesson. The fourth lesson involves connecting the notion of individual right with that of personal interest through the use of taxation and prices as regulatory devices. (See also W71-09752) (White-Iowa State)
W71-09763

BASIC DATA ON HEAT DISSIPATION DOWNSTREAM FROM LARGE HEAT SOURCES,
Geological Survey, Washington, D.C.
A. P. Jackman, and E. L. Meyer.
In: Fifth Annual Health Physics Society Midyear Tropical Symposium, Health Physics Aspects of Nuclear Facility Siting, Vol. 3, p. 748-763, November 3-6, 1970. Idaho Falls, Idaho, 8 fig.

Descriptors: *Thermal pollution, *Thermal powerplants, Temperature, Meteorological data, Convection, Sites, Stream flow, Mass transfer, Water pollution control.
Identifiers: *Thermal discharge, *Heat dissipation, *Heat flux.

The heat dissipation has been measured downstream from 7 large heat sources on rivers in the United States by the United States Geological Survey in cooperation with the United States Atomic Energy Commission. The purpose of the measurements was to provide basic reference data for the planning and design of thermal electric power stations and for verification of theoretical models of heat dissipation in streams. The data were collected during intensive 24-hour surveys repeated up to three times during one year at each site. Stream temperature and discharge data in great detail were obtained at several cross sections in reaches extending up to 31 km downstream from the heat source; selected meteorologic data were also collected within each reach. Even in the longest reaches more than 60 percent of the added heat was observed in the river at the downstream end of the reach. These observations are consistent with a theoretical evaluation of the heat dissipation based on the Stefan-Boltzmann equation, Harbeck's mass transfer approximation of evaporative heat flux, and the Bowen ratio. Heat losses observed varied greatly and include an episode when practically no loss of heat was observed for six hours in a 10-mile reach despite water temperatures 10C higher than air temperatures, probably due to a dense fog confined to the stream channel. (Upadhyaya-Vanderbilt)
W71-09765

NAVIGABLE WATERS POLLUTION CONTROL ACT OF 1965 (A BILL TO PROVIDE FOR THE ESTABLISHMENT OF REGULATIONS FOR THE PURPOSE OF CONTROLLING POLLUTION FROM VESSELS AND OTHER SOURCES IN THE NAVIGABLE WATERS OF THE UNITED STATES).
For primary bibliographic entry see Field 06E.
W71-09766

CHLORINE MAKERS CLUTCH AT LAST DROPS OF MERCURY.

Chemical Week, Vol. 108, No. 8, p. 75-77, February 24, 1971.

Descriptors: *Heavy metals, Water pollution control, Pollution abatement.
Identifiers: *Mercury, *Chlorine industry, *Mercury recover.

The problems of stopping mercury losses are complex. In general, mercury leaves the mercury cells of a chlorine plant primarily in the hydrogen, caustic and chlorine streams. It is also found in the cell outlet brine, filter, various wastewater and condensate streams. At least one plant is using ferrous chloride, instead of inorganic sulfides, for precipitation, which results in the range of 100-300 ppb of mercury in the effluent. Other methods of reducing mercury contents in the effluent are mentioned such as Bayer's method which, with the use of carbon, reduces mercury concentration to 0.01 mg/m³, or Ventron's method of precipitating metallic mercury. N.J. Zinc has demonstrated the application of zinc dust for dramatic reduction of mercury in wastewaters. (Oleszkiewicz-Vanderbilt)
W71-09783

A BILL TO AMEND THE INTERNAL REVENUE CODE OF 1954 TO ENCOURAGE THE ABATEMENT OF WATER AND AIR POLLUTION BY PERMITTING AMORTIZATION OF THE COST OF ABATEMENT WORKS.

For primary bibliographic entry see Field 06E.
W71-09785

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT IN ORDER TO ESTABLISH A PROGRAM TO DECREASE WATER POLLUTION BY SYNTHETIC DETERGENTS.

For primary bibliographic entry see Field 06E.
W71-09786

EVALUATING OIL SPILL CLEANUP AGENTS. DEVELOPMENT OF TESTING PROCEDURES AND CRITERIA.

California State Water Resources Control Board, Sacramento.
Charles R. Hazel, Fred Kopperdahl, Norman Morgan, and Walter Thomsen.
California Water Resources Control Board Publication No. 43, July 6, 1970, 150 p, 67 fig, 17 tab, 100 ref.

Descriptors: *Oil wastes, *Cleaning, *Dispersion, *Chemicals, *Surfactants, *Toxicity, *Bioassay, Fish, Shellfish, Algae, Degradation.
Identifiers: *Dispersants, *Collecting agents, *Sinking agents, Effectiveness, Testing procedures, Criteria, Classifications.

Criteria for licensing and regulating the use of oil spill cleanup agents was studied and developed. Criteria included toxicity, performance effectiveness and physical-chemical descriptions of the OSCA. Bioassays were performed to establish 96-hour TLM values for dispersants, oil and combinations of oil and dispersants. Biodegradation of dispersants was tested by BOD, foam calibration and toxicity decay bioassay. Miscibility with seawater, percent of oil emulsified, oil sinking and dispersion after several hours were the criteria for performance effectiveness tests. Feasibility of 'fingerprinting' dispersants were tested quantitatively. Licensing criteria and test procedures for product flash point, P.H, trace substances and occupational health hazards were determined. (Ensign-PAI)
W71-09789

ESCAROSA: A PRELIMINARY STUDY OF COASTAL ZONE MANAGEMENT PROBLEMS AND OPPORTUNITIES IN ESCAMBIA AND SANTA ROSA COUNTIES, FLORIDA.

Florida Coastal Coordinating Council, Tallahassee.
For primary bibliographic entry see Field 02L.
W71-09794

1970 REPORT OF THE INTERSTATE SANITATION COMMISSION.

Interstate Sanitation Commission, New York.

Report of the Interstate Sanitation Commission on the Water Pollution Control Activities and the Interstate Air Pollution Program, 1970, 69 p.

Descriptors: *Water pollution control, *Waste water disposal, *Water analysis, *Biochemical oxygen demand, *Treatment facilities, Nutrients, Coliforms, Air pollution, New York, New Jersey, Connecticut.

A record of the water and air pollution activities of the Interstate Sanitation Commission and the work and planning on water pollution control projects within the Interstate Sanitation District are reported for 1970. Planning and construction provided for a minimum of 80% BOD removal to waste water effluents discharged into District waters. Ability to conduct additional analyses which enabled the commission to act as a regional laboratory for state and federal agencies was expanded. A training program for treatment plant operators was continued. Dissolved oxygen and coliform density

showed an increase since the last report. The Commissions responsibilities and programs for air pollution are also reported. (Ensign-PAI)
W71-09801

ALTERNATIVE OXYGENATION POSSIBILITIES FOR LARGE POLLUTED RIVERS.

Putgero-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
William Whipple, Jr., and Shaw L. Yu.
Water Resources Research, Vol 7, No 3, p 566-579, June 1971. 14 p, 12 fig, 1 tab, 23 ref. EPA - Water Quality Office Project 16080 DUP.

Descriptors: *Water pollution treatment, *Aeration, *Oxygenation, *Delaware River, *Estuaries, Reaeration, Application equipment, Cost-benefit analysis, Sewage treatment, Stream improvement.
Identifiers: Delaware Estuary.

The idea of induced aeration of polluted rivers is gaining acceptance, prototype equipment having been installed on the Miami River in Ohio and on the Ruhr River in Germany. Aeration is feasible and in use on some small rivers. This paper describes tests of aeration equipment on a major river, the Delaware Estuary, and discusses transfer efficiency, suitable aerator system design, and cost comparisons. Navigational considerations and deeper, more turbulent water cause design requirements for large rivers to differ considerably from the requirements for small rivers. Reinforced aerators at the surface appear favorable for uncrowded river areas, but air diffusers on the bottom appear more practicable and comparably economical for port areas. Diffusers can be placed only on channel margins and anchorage areas, but dispersion studies indicate that the oxygenated water will still reach the center of the river within a reasonable distance. The cost of adding one unit of dissolved oxygen by aeration devices appears to be just about one-fourth that of adding it by waste treatment only. There are possibilities of lowering costs further by using oxygen diffusers. (Knapp-USGS)
W71-09821

GUNDY V VILLAGE OF MERRILL (CITY'S RESPONSIBILITY FOR NUISANCE CREATED BY OPEN DRAINAGE OF SEWAGE).

For primary bibliographic entry see Field 06E.
W71-09869

PANGLOSS ON POLLUTION,

London School of Economics and Political Sciences (England).
E. J. Mishan.
Swedish Journal of Economics, Vol 73, No 1, March 1971, p 113-120.

Descriptors: *Pollution, Resource allocation, Risk, Welfare economics, Effluents, Water pollution control.
Identifiers: *Transaction costs, Equity, Spillover problem, Subsidy, Frictional cost, External diseconomy.

The view is considered that pollution above a theoretical optimum is justifiable economically as long as the transaction costs of correcting the sub-optimal position exceed the optimality gains. Because of welfare effects and the magnitude of transaction costs, the overall optimal outputs of polluting activities under pollution permitting laws can be much greater than under optimal outputs under pollution prohibiting laws. For environmental pollution, the case for a change to anti-pollution laws rests mainly on equity and allocative merit with particular attention paid to the external diseconomies of increasing risk from adverse spillovers for future generations. This paper is of interest to water research concerned with pollution control. (Siegenthaler-Rutgers)
W71-09877

MODELS FOR INVESTIGATION OF INDUSTRIAL RESPONSE TO RESIDUALS MANAGEMENT ACTIONS.

Resources for the Future, Inc., Washington, D.C.
Clifford S. Russell.
The Swedish Journal of Economics, Vol 73, No 1, March 1971, p 134-156.

Descriptors: *Residuals management, Decision-making, Sewage treatment linear programming, Prices, Sensitivity analysis, Water pollution control.
Identifiers: *Cost of discharge, Objective function, Algorithm, End-of-pipe treatment.

It is argued that, for purposes of residuals management decisions, it is necessary to go beyond models that stress end-of-pipe treatment and a single receiving medium. Doubts are presented concerning the cost-of-discharge-reduction approach because it ignores the laws of conservation of energy and mass. The model used to investigate industrial response to residuals management policies reflects both the interconnections between residual forms and discharge media implied by the conservation of mass and energy and the opportunities available for the reduction of residuals generation in production. A description of the firm's decision-making process concerning residuals discharges is given and then modified to a form solvable by linear programming algorithms. An example is presented of the application of the linear residuals response model to the petroleum industry. The use of models of industrial response to residual management action for regional residuals management is considered. (Siegenthaler-Rutgers)
W71-09878

A METHOD OF ESTIMATING SOCIAL BENEFITS FROM POLLUTION CONTROL,

Handelshogskolan i Stockholm (Sewden).
Karl-Goran Maler.
The Swedish Journal of Economics, Vol 73, No 1, March 1971, p 121-133.

Descriptors: *Pollution control, Recreation, Demand function marginal cost, Marginal utility.
Identifiers: *Willingness to pay, Social benefits, Pareto optimality, Public good, Consumer surplus, Opportunity cost.

An approach to the estimation of social benefits from water pollution control is presented. A theoretical framework is developed which enables derivation of the willingness to pay for public goods on the basis of information on demand functions for private goods. The marginal willingness to pay or the demand price for the public good can be estimated by estimating the expenditure function as a function of public goods supplied. An example is given illustrating the technique of deriving the expenditure function. The theorems on uniqueness of solutions to differential equations show that the expenditure function ultimately derived is the correct one. (Siegenthaler-Rutgers)
W71-09881

SHELBY LOAN AND TRUST CO V WHITE STAR REFINING CO (LIABILITY FOR POLLUTION OF LAKE).

For primary bibliographic entry see Field 06E.
W71-09882

BACKGROUND FOR THE ECONOMIC ANALYSIS OF ENVIRONMENTAL POLLUTION,

Resources for the Future, Washington, D.C.
Allen V. Kneese.
Swedish Journal of Economics, Vol 73, No 1, Mar 1971, p 1-24.

Descriptors: *Economic analysis, *Environmental quality, *Air pollution, *Water pollution, *Technology, Regional analysis, Wastes, Taxes, Investment, Population, Reservoirs, Sewage, Rivers, Transportation.

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Group 5G—Water Quality Control

Identifiers: *Residuals, Production, Consumption, External diseconomies, Materials balance, Recycling.

The scientific and technological aspects of environmental problems are discussed in order to complement and complete the economic approach to these difficulties. Global and regional effects of environmental pollution are presented individually, then tied together in a 'materials balance' approach. In the discussion of the global effects of pollution, meteorological, hydrological and atmospheric difficulties are analyzed, including changes in carbon dioxide, waste energy rejection into the atmosphere, and toxic agents in coastal waters and oceans. A separate section on waterborne residuals deals with degradable residuals and persistent pollutants while the discussion on airborne residuals encompasses types and sources of such residuals, atmospheric assimilative capacity, and property damages. Technological external diseconomies are accepted as a fact, with residuals generation as an inherent part of production and consumption. Various alternatives are presented for both air and water pollution, incorporating a discussion of economic analysis to choose the optimal method for coping with such environmental difficulties. (Murphy-Rutgers)
W71-09889

ESSAY ON ECONOMIC GROWTH AND ENVIRONMENTAL QUALITY,

California Univ., Riverside.
Ralph C. d'Arge.
Swedish Journal of Economics, Vol 73, No 1, Mar 1971, p 25-41.

Descriptors: *Pollution, Environmental quality, *Wastes, Effluents, Model studies, Water quality, Water resource development, Investment, Demand, Assimilative capacity, Air, Land.
Identifiers: *Production, *Consumption, *Economic growth, Balance of payment, Recycling, Employment.

The existence of a mutual interdependence between economic policy and environmental policy is proposed on the basis that production-consumption and waste emission are joint human products. Illustration is provided by a theoretical astronaut lost in space, and a Harrod type model. The astronaut analogy is presented to clarify optimal rate of consumption theories. The Harrod model is presented to indicate the rate of consumption over time and to further support the theory of interaction between the economy and the natural environment. Empirical analyses are made of the effect of effluent charges of certain countries on their comparative international advantage. Particular attention is given to waste generation, and the finite characteristic of natural resources. This article is relevant to all the fields of natural resources, encompassing water, air, and land resources. (Murphy-Rutgers)
W71-09890

DELAWARE RIVER BASIN COMMISSION RULES OF PRACTICE AND PROCEDURE AND BASIN REGULATIONS—WATER QUALITY.

For primary bibliographic entry see Field 06E.
W71-09898

THE USE OF STANDARDS AND PRICES FOR PROTECTION OF THE ENVIRONMENT,

Princeton Univ., N.J.
William J. Baumol, and Wallace E. Oates.
Swedish Journal of Economics, Vol 73, No 1, Mar 1971, p 42-54.

Descriptors: *Prices, *Taxes, *Government, *Environmental quality, Marginal cost, Social aspects, Costs Profits, Optimization, Pollution, Decision making, Public utilities.
Identifiers: *Subsidies, *Resource allocation, *Externalities, Social welfare employment, Inflation.

A means is suggested of achieving certain environmental standards that establish arbitrary levels of environmental quality. The method calls for imposition of charges on waste emissions sufficient to achieve these standards. The optimality properties and other advantages of the proposed pricing procedure are presented, and it is indicated that this particular method will achieve the desired reduction in pollution at minimum cost to the economy. The pricing and standards method proposed is contrasted with the Pigouvian technique of imposition of taxes or subsidies on externality-generating activities, and the former is shown to be more readily workable for somewhat the same effect. Projections for the success of the standards and pricing method are made, indicating a definite reduction in environmental pollution which aids in approaching optimal resource allocation. This method is relevant to the maintenance of the quality of water resources. (Murphy-Rutgers)
W71-09900

ENVIRONMENTAL CONTROL AND ECONOMIC SYSTEMS,

Handelshogskolan i Stockholm (Sweden).
Erck Dahmen.
Swedish Journal of Economics, Vol 73, No 1, March 1971, p 67-75.

Descriptors: *Environmental quality, *Economic analysis, Costs, Technology, Prices, Profits, Resource allocation, Decision making, Investment, Time.

Identifiers: *Capitalism, *Socialism, Charges, Regulation, Production, Growth, Public goods, Incentives, Socio-economic costs.

Environmental deterioration in countries with different economic systems is characterized. It proposes various methods to solve such difficulties in the different systems. Since the analysis is concerned with the basic causes of environmental pollution, the remedies proposed are relevant to the correction of water pollution problems in the United States. The cause of environmental pollution is industrialization and therefore is present in both a capitalistic and socialistic economy. A major factor in the failure of both systems to combat pollution has been inaccurate cost calculations, which has been responsible for misallocation of resources and environmental deterioration. Accurate cost calculations would encourage the choice of technological alternatives favorable to preserving the environment. Regulations are suggested as an alternative to charges for effective environmental policy compliances. (Murphy-Rutgers)
W71-09902

CANADIAN SCIENTIFIC PROGRAMS FOR OPTIMUM MANAGEMENT OF GREAT LAKES WATER RESOURCES,

Department of Energy, Mines and Resources, Ottawa (Ontario).
A. T. Prince, and J. P. Bruce.
In: Proceedings, Twelfth Conference on Great Lakes Research, Ann Arbor, Braun-Brumfield, Inc., 1969, p 877-882.

Descriptors: *Water resource development, *Great Lakes, *Economic analysis, *Management, Water quality, Erosion, Water supply, Shipping, Government, Eutrophication, Pollution, Recreation, Sewage, Waste treatment.
Identifiers: Socio-economics, Power plants.

A survey is presented of Canadian activities to promote optimum management of Great Lakes water resources. Problems dealt with include fluctuating water quantities, shore erosion, and deteriorating water quality. Economic solutions and implementation for them are being sought by various government agencies, academic personnel and private organizations and individuals. Research for longer term problems and international aspects of management and shipping remains the domain of the federal agency. There is a survey of the research activities of the Canada Centre for Inland

Waters, an organization responsible for major lake research. Recent research program developments are dealt with, giving particular attention to the areas of water balance, erosion, water quality, waste treatment, and hydrology. Coordination of research and data collection both with Canada and internationally is cited. Suggestions for the future propose that research activity respond to management needs and managers use immediately relevant research results. (Murphy-Rutgers)
W71-09903

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, SECOND VOLUME.

Cornell Univ., Ithaca, N. Y. Water Resources and Marine Sciences Center.

Compiled by Carol Kriss and Daniel P Loucks
Available from the National Technical Information Service as PB-200 727, \$3.00 in paper copy, \$0.95 in microfiche. Publication No 35, Water Resources and Marine Sciences Center, Cornell University, Ithaca, N Y, June, 1971, 253 p, 401 ref. OWRP Project W-111 (No1613) (1).

Descriptors: *Bibliographies, *System analysis, *Water resources, Optimization, Simulation analysis, Operations research, *Abstracts, Forecasting, Planning.

Presented is an annotated bibliography of some recent selected publications pertaining to the application of systems analysis techniques for defining and evaluating alternative solutions to water resource problems. This publication is a supplement to the annotated bibliography having the same title and published by the Cornell University Water Resources and Marine Sciences Center in August, 1969 (Publication No. 25). Most of the 400 references included in this volume were published during 1969 and 1970. Publications for 1971 are not included. Both subject and author indices are provided. Keywords (descriptors) are listed at the end of each abstract. The abstracted material emphasizes the application of optimization and simulation techniques for assisting in the planning and management of water resource systems.
W71-09465

CONVERGENCE CRITERIA FOR ITERATIVE HYDROLOGIC ROUTING MODELS,

Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 02A.
W71-09610

IMPROVEMENTS IN THE FINITE DIFFERENCE SOLUTION OF TWO-DIMENSIONAL DISPERSION PROBLEMS,

Guelph Univ. (Ontario).
For primary bibliographic entry see Field 05B.
W71-09611

HOW SWEDEN TACKLES POLLUTION,

Lund Univ. (Sweden).
For primary bibliographic entry see Field 05G.
W71-09687

INTRODUCTION TO OIL FIELD WATER TECHNOLOGY,

For primary bibliographic entry see Field 05E.
W71-09721

A GENERALIZED PROBABILISTIC APPROACH TO REGIONAL WATER SUPPLY ASSESSMENT, Environmental Dynamics, Inc., Los Angeles, Calif. John A. Dracup, Sharon G. Grant, Miguel A. Cardenas, and Thomas J. Fogarty. Available from the National Technical Information Service as PB-200 999, \$3.00 in paper copy, \$0.95 in microfiche. Completion Report, December 1970, 125 p, 5 fig, 65 ref, 4 append. OWRR Project C-1410 (No 1980) (1).

Descriptors: *Runoff, *Precipitation (Atmospheric), *Water supply, Mathematical models, *System analysis, Rainfall-runoff relationships, *Regions, Planning, *Model studies.
Identifiers: *Regional water supply assessment.

A methodology is developed to predict available water supply levels for a region. Using the technique of system identification the relationship between precipitation and runoff is mathematically modeled by a non-linear, time-variant system of partial differential equations derived from a kinematic wave formulation. The theoretical model is adapted to a particular watershed using parameter identification techniques. The development mathematical model is utilized to generate runoff data from long term precipitation data. The methodology is particularly applicable to regions of long term precipitation data but limited streamflow runoff data. Predictions of available regional water supply can be made through the use of confidence interval estimations.
W71-09735

STOCHASTIC POPULATION DYNAMICS FOR REGIONAL WATER SUPPLY AND WASTE MANAGEMENT DECISION-MAKING, Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 05G.
W71-09741

CONVOLUTION APPROACH TO THE SOLUTION FOR THE DISSOLVED OXYGEN BALANCE EQUATION IN A STREAM, Geological Survey, Fort Collins, Colo.
For primary bibliographic entry see Field 05B.
W71-09820

A FAST FRACTIONAL GAUSSIAN NOISE GENERATOR, IBM Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 07C.
W71-09823

WASTE WATER TREATMENT PLANTS, Federal Water Pollution Control Administration, Washington, D.C.

In: Public Facility Needs, Washington, US Government Printing Office, 1966, p 175-183.

Descriptors: *Waste water treatment, *Government, Watercourse, Pollution, Sewers, Capital, Population, Costs, Financing, Economic analysis, Effluents, *Treatment facilities.
Identifiers: *Public works, User charges, Construction costs, Operating costs, Growth rates.

A study of waste water treatment plants is presented. The necessity for such facilities is cited to protect the public health from waterborne disease, to prevent nuisances, and to prevent or abate public watercourse pollution. The nature and composition of the waste water treatment plants are delineated through a description of the physical characteristics and standard of performance, and a discussion of existing capital plant in the United States. The construction and operating costs of the plants are presented, as well as the user charges for the facility. Annual expenditures for sewage treatment plants is included in a presentation of trend of capital outlays, which discusses various forms and

sources of financing. Capital requirements and potential financing methods are included in a presentation of the needs and prospective capital outlays for waste treatment provision. The projection includes both cost estimates and an analysis of population factors. (Murphy-Rutgers)
W71-09866

ECONOMIC DECISION MODELS, Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 06B.
W71-09868

REGIONAL ECONOMIC DEVELOPMENT: THE RIVER BASIN APPROACH IN MEXICO, New York Univ., New York.
David Barkin, and Timothy King.
Cambridge, England: Cambridge University Press, 1970, 262 p.

Descriptors: *River basin development, *Resource allocation, Evaluation, Hydroelectric power, Project evaluation, Cost-benefit analysis, *Regions.
Identifiers: *Regional growth, Social cost, Social overhead capital, Internal rate of return, Linkage effect, Externalities, *Mexico.

This book considers the strategy of promoting regional development through river basin schemes using Mexico as a case study. The first section outlines the economic and political rationale for using integrated river basin schemes to carry out public investment in irrigation and hydroelectric projects. The Mexican River Basin Commissions represent an attempt to coordinate government expenditure under a semi-independent agency on a regional basis. The river basin projects are considered not only in terms of their contribution to increasing aggregate national income but also the effect of the projects on the supply of factors of production. The achievement of the river basin approach with respect to the absorption of unemployed and underemployed labor and natural resources is found to be unsatisfactory. The authors conclude that the river basin approach should be supplemented by other regional policies to achieve regional development. (Siegenthaler-Rutgers)
W71-09874

6B. Evaluation Process

NATIONAL CONFERENCE ON URBAN WATER RESEARCH, KEYNOTE AND PLenary SESSION PAPERS, Office of Water Resources Research, Washington, D.C.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price \$0.25. (Proceedings) Mar 17-19, 1970, Georgia Institute of Technology, 1971. 31 p, 2 append.

Descriptors: *Urbanization, *City planning, *Decision making, Social change, Aesthetics, *Water resources development.
Identifiers: *Metropolitan water resources management, *Water resources research, Urban ecology.

This report contains the keynote and plenary session papers presented at the National Conference on Urban Water Research. A companion report presents the program of research developed from the conference recommendations. Physical facilities for the conference were generously provided by the Georgia Institute of Technology. The Office of Water Resources Research is indebted to the Environmental Resources Center and the Department of Continuing Education of the Institute for the conference arrangements. Contents include: Introductory Remarks, H Garland Hershey; keynote Address, William C. Ackermann; Resource Development in the Urban Environment, Harvey O Banks; The Social Consequences of Natural Resource Development in Urban Regions, Maurice

M Feldman; The Economic Consequences of Natural Resource Development in Urban Regions, Joseph L. Fisher; and Engineering Alternatives in Natural Resource Development in Urban Regions, Samuel S Baxter. Appendix A presents the conference program agenda; appendix B is a roster of names and addresses of the 63 conference participants. (See also W71-09469)
W71-09468

A NATIONAL URBAN WATER RESOURCES RESEARCH PROGRAM, Office of Water Resources Research, Washington, D.C.

Available from Superintendent of Documents, US Government Printing Office, Washington, DC, 20402, Price \$0.35. (Proceedings), Mar 17-19, 1970, Georgia Institute of Technology, 1971, 54 p, append.

Descriptors: *Urbanization, *City planning, *Decision making, Social change, Aesthetics, *Water resources development.
Identifiers: *Metropolitan water resources management, *Water resources research, Urban ecology.

This report presents a program of research designed to improve water resources management in the urban environment. The proposed research program calls upon the physical, social, biological, and engineering sciences to develop knowledge required to shape solutions to present and future water problems in urban areas. Technology has a dual importance in this field: (1) the development, construction, and operation of physical works and equipment, and (2) the performance of urban water resources research. More information is needed on the hydrologic, biologic, and ecologic effects of urbanization, as well as means of measuring aesthetic and ecologic values against other tradition values. Research is also needed on the organization, determination of roles, the function and relationship of urban water resources institutions. The charge to OWRR is to identify research needs, to make these known, and to stimulate others to do research. What is clearly needed in the field of urban water resources research encompasses a broad range of problems. Significant results will depend on participation, cooperation, and coordination among Federal, State, and local governmental agencies, by the academic community, by industry, by private consultants and others qualified to conduct research. (See also W71-09468) (Wray-Chicago)
W71-09469

THE FUNCTION OF SOCIAL BEHAVIOR IN WATER RESOURCE DEVELOPMENT, Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.
Wade H. Andrews, and Dennis C. Geersten.
Available from the National Technical Information Service as PB-200 725, \$3.00 in paper copy, \$0.95 in microfiche. Center for Water Resources Research Report No 1, Utah State University, Logan, Utah, Dec 1970. 124 p, 2 fig, 55 tab, append. OWRR Project A-001-UTAH (7).

Descriptors: *Water resources development, Social aspects, *Attitudes, *Social values, *Planning, Decision making, Technology, Social change.
Identifiers: *Social behavior, Bear River Project, *Environmental problems.

Many water resource engineers and planners have indicated that some of the most difficult problems in successful water resource development relate to social problems. Social value alternatives, such as conservation, aesthetics, and recreation are involved in the choices of development, but cannot be easily quantified in economic terms. The present study deals with the effects of a proposal for the technological development of a water resource; in this case, The Bear River Project. The broad objectives of this exploratory work are: (1) to determine the social psychological value patterns affecting

Field 06—WATER RESOURCES PLANNING

Group 6B—Evaluation Process

water resource development; and (2) to determine how basic cultural and social organizational arrangements are interrelated in motivations and attitudes and affecting the development and use of water. One of the attitudes investigated in the study was concerned with whether interbasin transfer of water was right or wrong. Attitudes toward water use by various categories of residence provide insight into the location of likely support for future project proposals. It is expected that the broad exploratory nature of this study will provide a useful background for other studies with more specialized and limited goals. (Wray-Chicago)
W71-09470

A GEOGRAPHICAL MODEL FOR POLITICAL SYSTEMS ANALYSIS,
Clark Univ., Worcester, Mass. Graduate School of Geography.
Saul B. Cohen, and Lewis D. Rosenthal.
Geographical Review, Vol 61, No 1, p 5-31, Jan 1971. 3 fig, 28 ref.

Descriptors: *Systems analysis, *Political aspects, *Model studies, *Institutional constraints.
Identifiers: *Political process, *Geographical model, Venezuela.

The literature of contemporary political geography is wanting in methodological approaches by which general theory and hypotheses can be developed and tested. It is proposed that political geographers turn more directly to political processes and to the spatial consequences than has heretofore been the case, and that their efforts be cast within a political-geographical systems framework. The major points for analysis of political process are the political system, locational perspective, and the open/closed political system. A basic objective of analyzing process in a spatial context is to examine man's behavior in space. The force and extent of political action areas and counteraction areas are expressed by various measures of political socialization. What creates an action area is the acceptance of political policy by groups that count politically and the attendant social and economical consequences. A political systems model, Venezuela's petroleum and immigration transactions, is examined showing that the law-landscape thread is a key to the analysis of political system. The specific transactions discussed here have been viewed as elements in the total political process. The political systems model proposed here can serve as the analytical framework for an understanding of the relationship of process to geographical space. (Wray-Chicago)
W71-09471

COMPREHENSIVE WATER RESOURCES MANAGEMENT--THE PAST AND THE FUTURE,
Department of the Interior, Washington, D.C.
Everett A. Gordon.
Water Resources Bulletin, Vol 7, No 1, p 185-188, Feb 1971.

Descriptors: *Water resources development, *Environment, *Political aspects, Inter-agency cooperation, Economics.
Identifiers: *Water resources planning, *Environmental quality, Colorado River Basin, Environmental Protection Agency, Federal Water Quality Administration.

The historic approach to American water problems has been characterized by artificial separation of water quantity and water quality--often completely ignoring water economics. This separation is at all levels of government, with the resources management responsibility so divided that only through great effort to coordinate diverse programs and operations is the goal of comprehensive water resources management approached. It is apparent that water quality considerations should play a significant role in management decisions concerned with quantity. In dealing with water resources development the Congress is attempting to coordinate all levels of government action. Among

professionals, academic training provides only a narrow discipline orientation. The best approach to water problems lies in unified and comprehensive management agencies that assemble all of the knowledge, ability, techniques, disciplines, and resources needed to accomplish the management job. (Wray-Chicago)
W71-09472

THE EXPANDING CITY,
Northeastern Illinois Planning Commission, Chicago.
Matthew L. Rockwell.
Environmental Geology Notes, Illinois State Geological Survey, No 46, p 25-31, May 1971.

Descriptors: *City planning, *Decision making, Management, Inter-agency cooperation, Social change, *Planning.
Identifiers: *Metropolitan areas, Public policy, Comprehensive planning, Northeastern Illinois Planning Commission.

The physical development and deterioration of metropolitan areas is discussed. Public improvement programs for metropolitan areas often are severely inadequate because of insufficient planning for growth and contradictions in objectives. Private improvements are usually more disorganized than in the public sector with private developers influenced by profit potential and zoning regulations. Land use problems are all conflicts between one human activity and another; we are crowded together and yet too far apart for convenience and efficiency. The Northeastern Illinois Planning Commission has a comprehensive plan which calls for a stronger mass transportation system, industrial development, and opportunity for each person to improve his cultural, social, and economic conditions. Recommendations are directed to improving planning agencies and to recognition of the special problems of cities. (Wray-Chicago)
W71-09473

THE DEVELOPMENT AND USE OF COAL SURFACE - MINED LANDS IN ILLINOIS,
Midwest Coal Producers Inst., Springfield, Ill.
L. S. Weber.
Environmental Geology Notes, Illinois State Geological Survey, No 46, p 41-46, May 1971.

Descriptors: *Land use, *Mining, *Water resource, Development, *Recreation, Reclamation, *Illinois.
Identifiers: *Coal surfaced-mined lands, Environmental quality.

Reclamation of surface-mined lands dates back to 1920. Methods of reclamation include tree growth, forage production (seeding), recreation (primarily associated with water areas), multiple and intensive use. Tree growth was an early development, by natural seeding or planting. In 1964 a more scientific approach to tree planting was initiated. In forage production, mined lands are used for pasture by seeding and fencing. Recreational use of water areas created by mining operations is often hampered by water pollution. The use of strip-mined areas for waste disposal (land fill) is becoming important. The new method of sludge disposal from metropolitan sanitary plants is being researched. Multiple use is evidenced in the use of forage areas for hunting and of the forest areas for camping and other recreational activities. Examples of intensive use that can and will be expanded are homesites and industrial or business developments. (Wray-Chicago)
W71-09475

WATER RELATED ENVIRONMENTAL SERVICES.
Central New York Regional Planning and Development Board, Syracuse.

Available from the National Technical Information Service as PB198 086, \$3.00 in paper copy, \$0.95

in microfiche. Local Planning Agency technical report, Syracuse N.Y., Nov 1970. HUD Project NYP. 200.

Descriptors: *Regional analysis, *Planning, *Water supply, *Water pollution, Drainage, Flood control, Sewers, Water consumption, New York.
Identifiers: *Cayuga County New York, *Cortland County New York, *Madison County New York, *Oswego County New York, *Onondaga County New York.

This report summarizes the analysis phase of water supply, sewage disposal, storm drainage, and flood control in the Central New York Region. Present and expected problems of service quality and quantity have been examined along with potential measures to alleviate these problems and upgrade service. Interservice and service-to-environment relationships, involving such factors as environmental quality, benefit-cost considerations, economics of scale, and inertia arrangements, were noted throughout the analysis. The analysis included an examination of the various possible solutions to each locale's needs; some of the more involved alternatives are dealt with in detail.
W71-09572

PROCEEDINGS, MISSISSIPPI WATER RESOURCES CONFERENCE, 1971.
Mississippi State Univ., State College. Water Resources Research Inst.
For primary bibliographic entry see Field 05G.
W71-09628

ECONOMIC DETERMINANTS FOR SEDIMENT MANAGEMENT ON A NORTH MISSISSIPPI WATERSHED,
Economic Research Service, Oxford, Miss. Natural Resource Economics Div.
For primary bibliographic entry see Field 05G.
W71-09632

WATER RESOURCES PROBLEMS AND OPPORTUNITIES ASSOCIATED WITH MULTIPLE-PURPOSE IMPOUNDMENTS,
For primary bibliographic entry see Field 05G.
W71-09633

METHODS FOR PROTECTING AREAS OF WATER ORIGIN,
Colorado River Commission of Nevada.
Ivan P. Head.
Proceedings of the Western Interstate Water Conference, Strategies for Western Regional Water Development, Corvallis, Oregon, 1965, p 125-130.

Descriptors: *Water resources development, *Regional analysis, *Project planning, Cost-benefit analysis.
Identifiers: *Feather River Project, Pacific Southwest Water Plan, Western States Water Council.

The author states the case for the development of a comprehensive Western Water Plan which would combine the requirements and resources of all the western states. He explains that in the past three methods have been used to protect the areas of water origin, namely recapture statutes, political muscle and regional planning. He argues that regional planning has the most benefits. (Holmes-Rutgers)
W71-09685

PLANNING FOR WESTERN REGIONAL WATER DEVELOPMENT,
California Univ., Los Angeles.
Ernest A. Engelbert.
Proceedings of the Western Interstate Conference, Strategies for Western Regional Water Development, Corvallis, Oregon, 1965 p 17-62. 3 fig, 2 tab, 57 ref.

Descriptors: *Water resources development, *Project planning, *Economics, *Federal finance.
 Identifiers: *West, California State Water Plan, Colorado Basin, Pacific Southwest Water Plan, Snake - Colorado Project.

The author summarizes the major issues facing planners of water resource use in the western states. Whereas before 1965, U.S. water resource development was devoted primarily to the western states, the future promises more national concern with the subject. He discusses problems of planning, financing, priorities, and type of water resources development. (Holmes-Rutgers)
 W71-09697

A CASE STUDY OF WATER RESOURCES DEVELOPMENT - AN ANALYSIS OF A PROPOSED PROJECT ON THE MISSOURI RIVER,
 Cornell Univ., Ithaca. Water Resources and Marine Sciences.

Lawrence S. Hamilton, and Carlos D. Stern.

Technical Report No 28, April 1971, 2 p. OWRR Project A-024-NY (2).

Descriptors: Alternative costs, Annual benefits, Annual costs, Economic feasibility, *Economic justification, *Evaluation, *Hydroelectric power, *Missouri River, Montana (Multiple purpose projects), *Political aspects, Power marketing, *Recreation, *River basin development, Water resources, *Water resources development, *Wild rivers.

As a result of the analysis it is concluded that the 'Joint Report on Water and Related Land Resources for Missouri River, Fort Benton to Vicinity of Fort Benton, Montana, June 1963' fails to provide the decision maker with the range of information he would require and fails to provide a sufficiently accurate economic assessment of the benefits and costs to the Nation. Factual and conceptual inadequacies have been revealed. Factual inadequacies concern: use of reconnaissance data to formulate specific benefit and cost figures; uncertainties as to streamflow and evaporation loss; failure to include evaporation loss as a cost; failure to include reservoir filling as a cost; failure to include surge tanks and afterbays as costs; a rather amazingly low estimate for a bridge at the Judith River; a misleading figure for the mileage of the remaining stretch of wilderness waterway; inadequate consideration of the unstable nature of the Missouri Break rock formations; failure to account for or describe the scenic loss due to inundation; unsatisfactory methods of assigning recreation benefits; use of replacement flood control as a benefit of dams; use of 1957 data for power analysis. Conceptual inadequacies concern: several of the eleven supposed alternative proposals are redundant and obscure clear choice; there is an assumption that there are no alternative uses for money not employed in maximum physical development of the river; lack of consideration of marginality with the assumption of unsatisfied, constant demand for any produce or service; failure to establish a need for peaking power or to study transmission costs. The study also concludes that the independent review process for such project development proposals is inadequate, being carried out by the Board of Engineers for Rivers and Harbors, Federal Power Commission, and the Missouri Basin Inter-Agency Committee. It is hoped that the Water Resources Council can adequately fulfill this role.

W71-09740

MANAGEMENT OF WATER QUALITY IN RELEASES FROM SOUTHWESTERN IMPOUNDMENTS,
 Texas Univ., Austin. Environmental Health Engineering Program.

For primary bibliographic entry see Field 04A.

W71-09742

SELECTIVE WITHDRAWAL AS A WATER QUALITY MANAGEMENT TOOL FOR SOUTHWESTERN IMPOUNDMENTS,
 Texas Univ., Austin. Environmental Health Engineering Program.

For primary bibliographic entry see Field 04A.

W71-09743

ECONOMICS OF POLLUTION CONTROL,
 Iowa State Univ., Ames. Dept. of Economics.

For primary bibliographic entry see Field 05G.

W71-09761

STATE AND FEDERAL OUTDOOR RECREATION FACILITIES.

Department of the Interior, Washington, D.C. Bureau of Outdoor Recreation.

In: Public Facility Needs, Washington, US Government Printing Office, 1966, p 520-531.

Descriptors: *Recreation, *Water resource development, *Economic analysis, Multiple purpose projects, Forests, Fishing, Swimming, Costs, Taxes, Capital, Financing, Government.

Identifiers: *Public facilities, *Developed facilities, User charges, Entrance fees.

A study is presented of two types of Federal and State recreation facilities, namely developed facilities and natural resources of land and water. Areas included encompass parks, forests, fishing and hunting areas, reservoirs, and picnic areas, all of which are discussed for both recreational value and economic worth to nearby communities. The recreation facilities are described, and the existing capital plant for such facilities is presented. Construction and operating costs are presented, with reference made to the wide variance caused by location, terrain, and facility design. User charges are broken down into campground charges, entrance fees, user fees, and taxes. The trend of capital outlays is treated, with special attention being given to sources of financing for the recreation facility. The future needs and prospective capital outlays are forecast according to capital requirements and available sources of financing, such as taxation and the land and water conservation fund. (Murphy-Rutgers)

W71-09865

ECONOMIC DECISION MODELS,

Oregon State Univ., Corvallis.

James L. Riggs.

New York, McGraw-Hill, 1968, 401 p.

Descriptors: *Decision-making, Economic evaluation, Operations research, Marginal cost, Resource allocation, Linear programming, Risk, Uncertainty probability, Game theory, Interest rate.

Identifiers: *Economic decision models, Econometrics, Opportunity cost, Break-even analysis, Gantt chart.

This book is essentially a quantitative approach to practical management and government problems but also considers the theoretical and nonquantitative aspects of decision-making as well. The author outlines deterministic decision-models and then discusses probabilistic models. The use of linear programming to deal with resource allocation problem is illustrated through examples. Techniques such as cost-benefit analysis and the payback method are used to lead to a time evaluation of strategic projects. The author then considers decisions recognizing risk. Concepts of risk are defined and the effect of variability on the decision problem is recognized. Probabilistic models such as expected utility, discounted-decision trees, queuing and simulation are considered. The final decision models dealt with are those project evaluations made under uncertainty using game theory techniques. This book is relevant to water research concerned with decision-making and project evaluation. (Siegenthaler-Rutgers)

W71-09868

THE WORLD OF WATER,
 Minnesota Univ., Minneapolis.

William C. Walton.

New York, Taplinger Publishing Company, 1970, 317 p.

Descriptors: *River basin development, Cost-benefit analysis, *Economic evaluation, *Water demand, Groundwater, Aquifer, Water pollution, Social welfare, Reimbursement, Decision-making. Identifiers: *Water-based recreation, Water resource management, Opportunity cost.

This book considers the economic, legal, social, and physical aspects of water resource planning and management. The role of economic policy, reimbursement, and project evaluation in planning water development programs are discussed. The geologic problems concerned with groundwater are noted in conjunction with aquifer conditions. Five concepts of river basin development are outlined: multiple-storage project, basinwide management, comprehensive regional management, articulated land and water programs with unified administration. The author discusses various criteria that are used in decision-making for river basin planning including cost-benefit analysis, social criteria, political constraints and the physical environment and hydrologic criteria of feasibility. Examples of river basin planning in the United States and Germany are presented along with research studies that are used in comprehensive planning. (Siegenthaler-Rutgers)

W71-09870

DECISION MAKING THROUGH OPERATIONS RESEARCH,

Xavier Univ., Cincinnati, Ohio.

Robert J. Thierauf, and Richard A. Grosse.

New York, John Wiley and Sons, Inc, 1970, 570 p.

Descriptors: *Decision-making, *Operations research, Linear programming, Nonlinear programming, Uncertainty, Dynamic programming, Probability, Optimization, Game theory, Economic evaluation, Systems analysis.

Identifiers: *Heuristic programming, PERT, Decision tree Lagrange multiplier, Objective function, Matrix algebra.

This book considers available techniques of operations research that are readily applicable for decision-making. The author surveys quantitative methods, background material in probability theory and matrix algebra as a preparation for the application of decision-making models. Methods for dealing with decision-making under uncertainty are presented. The Program Evaluation and Review Technique (PERT) is outlined with its advantages and disadvantages discussed through use by government agencies. Optimization models are considered and distinguished from iterative models that search through many alternative courses of action for an optimal solution. The techniques of linear programming, nonlinear programming, dynamic programming, game theory, and Markov analysis are presented. Future trend in operations research are discussed with stress placed on heuristic programming. This book is relevant to water studies concerned with the application of operations research techniques to decision-making. (Siegenthaler-Rutgers)

W71-09871

SOME NEW APPROACHES TO RISK,

Pittsburgh Univ., Pa.

R. Byrne, A. Charnes, W. W. Cooper, and K.

Kortanek.

Accounting Review, Vol 43, No 1, Jan 1970, p 18-37.

Descriptors: *Risk, Operations research, *Decision-making, *Probability, Capital budgeting, Linear programming, Sensitivity analysis, Economic evaluation.

Identifiers: *Chance-constrained programming, Payback period, Decision tree, Algorithm.

Field 06—WATER RESOURCES PLANNING

Group 6B—Evaluation Process

Newer methodological approaches to risk, conceptualized by information in the form of probability distributions, and considered. Some of the approaches proceed by reference to a single-figure-of-merit optimization while others are concerned with the explicit consideration of risk. The latter approaches such as linear programming and chance constrained programming are illustrated with example using different assumptions about the state of information for decision-making. Chance constraints can serve as a feasibility check on previous decision assumptions relative to risk policies. Examples of models including both rate of return and payback as well as risk are given for evaluating prospective projects. This paper is relevant for water research concerned with the application investment decision-making in the presence of uncertainty. (Siegenthaler-Rutgers)
W71-09872

RISK ANALYSIS IN PROJECT APPRAISAL,
International Bank for Reconstruction and Development, Washington, D.C.
Louis Y. Pouliquen.
Baltimore, Johns Hopkins Press, 1970, 79 p.

Descriptors: *Project evaluation, Risk, Resource allocation, Decision-making, Probability distribution, Cost-benefit analysis, Sensitivity analysis, Costs, Simulation, Correlation, Elasticity of demand.
Identifiers: *Rate of return, Present worth, Beta distribution, Growth rate.

This book discusses the applications of risk analysis to project appraisal based on World Bank examples. The methodology is illustrated through the case study of the Port of Mogadiscio. Initially, cost-benefit analysis was used but proved inadequate and sensitivity analysis was then used to narrow the sources of uncertainty in the variables. A risk analysis with cumulative probability distributions was used to deal with uncertainties and to generate economic rates of return. The author then considers some of the problems of risk analysis, namely, the correlation among variables, the choice of a probability distribution, and the means and cost of risk analysis. The conclusions of one study are that risk analysis is a useful technique for handling marginal projects, unusual uncertainties, optimization of project specifications, and project identification. This book is relevant to water research concerned with the role of risk in project evaluation. (Siegenthaler-Rutgers)
W71-09876

MODELS FOR INVESTIGATION OF INDUSTRIAL RESPONSE TO RESIDUALS MANAGEMENT ACTIONS,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-09878

SYSTEMS ANALYSIS AND PROJECT MANAGEMENT,
Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
David I. Cleland, and William R. King.
New York: McGraw-Hill, 1968, 307 p.

Descriptors: *Systems analysis, *Planning, Decision-making, *Evaluation, Resource allocation, Operations research, Optimization cost-benefit analysis, Planning-Programming-Budgeting, Network design.
Identifiers: *Information system, Isocost line, PERT, Cantt chart.

This book presents systems analysis and project management in a form that demonstrates their applicability to a variety of governmental managerial environments. A conceptual framework for systems analysis is outlined that relies on the outcome array as a basic tool. The authors then consider the role of models in systems analysis and use cost-benefit analysis to illustrate the application of

models to decision-making. The relationship between programming-planning-budgeting and systems analysis is outlined. The authors then discuss techniques for use in the planning and control of a particular project. Network planning is used to depict the interrelationship between activities and events and the sequence in which they are to be accomplished. The PERT method is utilized to convert time estimates for plan completion to an expected activity time. This book is relevant to the water administrator concerned with project planning and control. (Siegenthaler-Rutgers)
W71-09879

A METHOD OF ESTIMATING SOCIAL BENEFITS FROM POLLUTION CONTROL,
Handelshögskolan i Stockholm (Sewden).
For primary bibliographic entry see Field 05G.
W71-09881

BENEFITS AND BENEFICIARIES: CONTRASTING ECONOMIC AND CULTURAL DISTINCTIONS,
Oregon State Univ., Corvallis.
Courtland L. Smith, and Thomas C. Hozg.
Water Resources Research, Vol 7, No 2, April 1971, p 254-263.

Descriptors: *Water resource investment, Cost-benefit analysis, Evaluation, Optimization, *Decision making, Cost, Economic efficiency.
Identifiers: *Beneficiary, Benefactor, Role, Reciprocity, Subsidy, Income distribution.

The importance of the social and cultural context for water resource development decision making is considered. The authors examine cost-benefit analysis, an evaluative process for determining the ratio of benefits to costs in economic terms, which when translated into social terms considers the role of beneficiary or benefits and benefactor or costs. Comparative observations of peoples of the Pacific Northwest, Salt River Valley of Arizona, and the Sahara desert of Africa and their role in resource development show interesting differences in the nature of role performance relative to receipt of water resource benefits and repaying the cost of creating these benefits. The authors conclude that cost-benefit analysis is not an objective value free logical system, but it is a logical system conceived to optimize a unique set of cultural values. (Siegenthaler-Rutgers)
W71-09884

A PLANNING APPROACH TO THE PUBLIC GOOD PROBLEM,
Institut National de la Statistique et des Etudes Economiques, Paris (France).
E. Malinvaud.
Swedish Journal of Economics, Vol 73, No 1, Mar 1971, p 98-112.

Descriptors: *Planning, Budget constraints, Tax, *Decision making, Welfare economics, Demand.
Identifiers: *Public good, Equity, Collective consumption, Pareto optimal, Willingness to pay.

The theory of planning is used to deal with the problem of how to achieve an optimal provision of public goods. The model used has two consumers and two commodities (one public and one private good). First, the solution suggested by E. Lindahl is discussed as a part of the planning approach and found to be unsatisfactory from equity standards. The author modifies this solution to satisfy the equity provisions. Procedures using quantity indicators were then used and consideration was given to three requirements: convergence to an optimum, equitable treatment of the two consumers, and incentives for correct revelation of preferences. It was found that procedures using quantity indicators were more effective than procedures using tax indicators. This paper is relevant to water research concerned with the theory of planning and public goods. (Siegenthaler-Rutgers)
W71-09886

BACKGROUND FOR THE ECONOMIC ANALYSIS OF ENVIRONMENTAL POLLUTION,
Resources for the Future, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-09889

ESSAY ON ECONOMIC GROWTH AND ENVIRONMENTAL QUALITY,
California Univ., Riverside.
For primary bibliographic entry see Field 05G.
W71-09890

URBAN LOCAL OUTDOOR RECREATION FACILITIES,
Department of Housing and Urban Development, Washington, D.C.
Jack A. Underhill.
In: Public Facility Needs, Washington, U.S. Government Printing Office, 1966, p 532-554.

Descriptors: *Recreation, *Capital, *Costs, *Financing, *Government, Beaches, Pools, Natural resource development, Government, Taxes.
Identifiers: *User charges, *Capital outlays, *Estimated needs, Recreation centers, Ownership, Expenditures.

Local, publicly owned facilities are discussed for outdoor recreation such as parks, playgrounds, beaches, pools, recreation building, and indoor recreation centers. The physical characteristics of such facilities are discussed, as are the services they render, and general guidelines for measuring their standards of performance. A discussion of existing capital plant includes national estimates, state distribution, and city distribution of the facilities discussed, as well as age, ownership and estimated current value of the facilities. Land acquisition, development, maintenance and operating costs precede a presentation of user charges that is broken down according to degree of use, extend of coverage, taxes, and borrowing. Trend of capital outlays includes local expenditure figures and cites such sources of capital as state, federal government, county, and private investment. A basis is given of projected needs of the facilities on a yearly basis, and according to community size, following which various sources for future financing are suggested. The important role of water use in outdoor recreation makes this article relevant to water based recreation studies. (Murphy-Rutgers)
W71-09892

SOME FACTORS ASSOCIATED WITH THE CEDLINE OF THE LAKE ERIE COMMERCIAL FISHING INDUSTRY IN OHIO,
Toledo Univ., Ohio.
Donald W. Lewis.
In: Proceedings, Twelfth Conference on Great Lakes Research, Ann Arbor, Braun-Brumfield, Inc, 1969, p 834-842.

Descriptors: *Lake Erie, *Fishing, *Economic analysis, Time, Costs, Economic efficiency, Technology, Population, Salting, Capital costs.
Identifiers: *Political factors, *Biological factors, Real value of catch, Storage, Freezing.

The problems associated with the decline of the commercial fishing industry on Lake Erie in Ohio are considered. The real value of the fishing catch is used as a measure of the state of the industry. An analysis of the timing places the start of the decline about 1943. The adverse effect of the changing fish population is considered a factor, although this is thought to be one of the lesser causes. Competition for the Ohio industry is categorized as largely between sportsmen and the Ontario commercial industry. Problems of competitive labor costs, labor productivity, permissive regulation, and stagnant technology are also cited. The industrial structure is characterized as weak and market competition from non-fish protein sources and freshwater fishery products is indicated as a strong factor contributing to the decline. The concluding remarks blame economic and political factors for the decline of the industry, in which biological factors

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have also contributed a noticeable deleterious effect. (Murphy/Rutgers)
W71-09897

COMPREHENSIVE WATER RESOURCES PLANNING—ITS IMPLICATIONS FOR FISH AND WILDLIFE RESEARCH AND MANAGEMENT,

Bureau of Commercial Fisheries, Ann Arbor, Mich.

Robert L. Scheuler.

In: Proceedings, Tenth Conference on Great Lakes Research, Ann Arbor, Braun-Brumfield, Inc., 1967, p 447-455.

Descriptors: *Water resources development, *Planning, *Great Lakes, *River basins, Government, Decision making, Flood control, Water supply, Navigation, Pollution, Fishing, Budgets, Forecasting.

Identifiers: *Comprehensive approach, Multiple-usage, Economic growth, Hydro-electric power.

The interests and research of the fish and wildlife biologist are correlated with comprehensive water resources planning of river basins. The history of such planning is surveyed and the development of water resources activities for the Great Lakes area is given special attention. A discussion of the implementation of the water resources planning is presented and such implementation is then related to the work and interests of the individual and agencies primarily concerned with fish and wildlife research and management. Indication is that this last section can also apply appropriately to many other water-related disciplines. Topics dealt within the study include multiple-usage of the water facilities, demand for water and land-related resources, Flood control, water supply, water quality, navigation, hydro-electric power, and outdoor recreation. Project needs, authorizations and projections are also discussed in light of their contribution to economic growth. (Murphy-Rutgers)
W71-09899

ENVIRONMENTAL CONTROL AND ECONOMIC SYSTEMS,

Handelshogskolan i Stockholm (Sweden).

For primary bibliographic entry see Field 05G.
W71-09902

CANADIAN SCIENTIFIC PROGRAMS FOR OPTIMUM MANAGEMENT OF GREAT LAKES WATER RESOURCES,

Department of Energy, Mines and Resources, Ottawa (Ontario).

For primary bibliographic entry see Field 05G.
W71-09903

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

WISCONSIN WATER RESOURCE PROBLEMS,

Wisconsin Dept. of Natural Resources, Madison.

L. P. Voigt.

Wisconsin Conservation Bulletin, Vol 35, No 1, Jan-Feb. 1970, p 3-5. 2 fig.

Descriptors: *Water resources development, Water pollution control, Federal finance, Pulp and paper industry.

Identifiers: *Wisconsin Department of Natural Resources, Federal Water Pollution Control Act, Fox River.

The major water concerns of the State of Wisconsin are described. In order to continue water treatment efforts, flood plain management and recreational use of water supplies, the author explains the need for more federal funds. (Holmes - Rutgers)
W71-09485

CAN COST BE CUT,

Hazen and Sawyer, New York.

Walter B. Sinnot.

Journal American Water Works Association, Vol 62, No 11, p 694-704, Nov 1970. 1 tab.

Descriptors: *Water supply, Water pollution control, Cost comparisons, Project planning, Construction costs.

Identifiers: *Springfield, Mass., Littleville Reservoir, N.J. State Highway Dept., Middle Branch Westfield River, Connecticut River, Appalachian Mts.

Water resources are more costly every day. Here, a joint discussion of three ways to approach the engineer, the supplier, and the operator. Each has unique problems which beset him and costs incurred by their tasks. (Campbell-Rutgers)
W71-09488

COST OF WELLS AND PUMPS,

Illinois State Water Survey, Urbana.

For primary bibliographic entry see Field 04B.

W71-09730

COST OF PUMPING WATER,

Illinois State Water Survey, Urbana.

For primary bibliographic entry see Field 04B.

W71-09731

PUBLIC GOODS AND INCOME DISTRIBUTION,

Maryland Univ., College Park.

Henry Aaron, and Martin McGuire.

Econometrica, Vol 38, No 6, Nov 1970, p 907-920.

Descriptors: *Taxes, *Marginal utility, Economic efficiency, Resource allocation, Sensitivity analysis, Costs.

Identifiers: *Income distribution, Public good, Externalities, Utility function, User charge.

An alternative approach is presented to the measurement of the benefits and burdens of government expenditures on public goods. Previous studies of the distributional effects of public budgets have not acknowledged that allocation of the benefits of public goods depends on an assumed utility function. This study shows that the impact of the budget on income distribution cannot be evaluated unless a utility function is employed to estimate public good income. The choice of the utility function critically influences the results. The authors find that studies that focus on income brackets alone obscure some distributional questions and that a more fruitful approach should take account of the distributional impact of public budgets among groups defined not only on the basis of income but on economic, social, and demographic characteristics as well. This paper is relevant to water research concerned with the effect of water research projects on income distribution. (Siegenthaler-Rutgers)
W71-09873

CAPITAL ALLOCATION THEORY: THE STUDY OF INVESTMENT DECISIONS,

University of Southern California, Los Angeles.

Gerald A. Fleischer.

New York, Appleton-Century-Crofts, 1969, 291 p.

Descriptors: *Evaluation, *Decision-making, Risk, Interest rate, Depreciation, Sensitivity analysis, Probability, Decision theory, Capital cost, Marginal cost.

Identifiers: *Capital budgeting, Equivalence theory, Present worth, Cash flow, Payback method, Rate of return, Annual cost.

This book first describes the capital budgeting problem and then discusses the principles that form the rational basis for capital budgeting procedures. The mathematics of compound interest are then derived and the principal techniques of economic evaluation: annual cost, present worth, and rate of return are discussed. Each of these methods considers the amount and timing of cash flows; they

differ only with respect to the reference time used. Procedures for dealing with investment proposals that are mutually exclusive are outlined for the selection of the optimal project. The author then considers the effect of uncertainty and presents several techniques based on sensitivity analysis, decision theory and probability theory for dealing with risk and uncertainty in capital budgeting. The author presents various procedures for implementing the capital budgeting theory in decision-making. This book is relevant to water studies concerned with decision-making and project evaluation. (Siegenthaler-Rutgers)
W71-09875

PANGLOSS ON POLLUTION,

London School of Economics and Political Sciences (England).

For primary bibliographic entry see Field 05G.

W71-09877

PRIVATE COSTS OF USING PUBLIC GOODS,

Purdue Univ., Lafayette, Ind.

Robert A. Meyer, Jr.

The Southern Economic Journal, Vol XXXVII, No 4, Apr 1971, p 479-488.

Descriptors: *Costs, *Government, *Economic analysis, *Optimization, Model studies, Prices, Technology, Government supports, Income, Taxes.

Identifiers: *Quasi-public goods, *Private goods, *Rejectability, *Excludability, Equilibrium, Transfers, Consumption, Multipliers, Constraints.

An attempt is made to clarify the term 'exclusion,' to discuss public goods, and to analyze the properties of general equilibria attainable as the outcome of voluntary agreement in the presence of private costs of using quasi-public goods. Excludability should be considered symmetric to rejectability in dealing with commodities provided by governmental units. Various stipulations are proposed for a non-excludable, non-rejectable commodity to focus on rejectability and private user cost elements. The analysis is then extended to propose stipulations for a non-excludable but rejectable commodity, termed a quasi-public good. The private costs for such a good are then presented, followed by an analysis of subsidies, lump-sum transfers, and laws for altering consumption of the good. The formal optimality conditions associated with quasi-public goods are presented with and without user costs. Changes in welfare implications stemming from models including these goods are discussed, and the existence of a general equilibrium is established for a model including quasi-public goods and the associated prices for private goods. This paper provides insight into the public good aspect of water resources and should be of interest to theoretically oriented water research. (Murphy-Rutgers)
W71-09893

BEHAVIOR OF THE FIRM UNDER REGULATORY CONSTRAINT: NOTE,

Polytechnic Inst. of Brooklyn, N.Y.; and Hawaii Univ., Honolulu.

Israel Pressmar and Arthur Carol.

American Economic Review, Vol LXI, No 1, Mar 1971, p 210-212.

Descriptors: *Public utilities, *Economic efficiency, *Investment, *Rate of return, Prices, Government, Demand, Optimization, Capital, Profit.

Identifiers: *Regulatory constraint, *A-J effect, *Monopoly, Continuity, Marginal revenue product.

The 'A-J Effect', holding that a firm will tend to increase its investment with the introduction of an active constraint on its rate of return, is scrutinized. This effect was postulated both by the persons for which it is named (Averch and Johnson) and by Takayama. The authors of this article show that the 'A-J Effect' cannot be derived from the basic assumptions of the model since the assumptions used

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require an assumption that the 'A-J Effect' exist in the first place. The model is presented and then analyzed in light of the assumptions involved, particularly the offending equations used to derive the conditions for continuity, which depend for their usefulness on the preexistence of the A-J effect. The authors then prove that the A-J effect is impossible without these two assumptions (which are invalid). This article is particularly relevant to the regulation of natural monopolies such as water utilities. (Murphy-Rutgers)
W71-09894

A NOTE ON SUPPLEMENTAL APPROPRIATIONS IN THE FEDERAL BUDGETARY PROCESS,

Carnegie Inst. of Tech., Pittsburgh, Pa.

Gary W. Bowman, Otto A. Davis, Henry J. Gailliot, and Alan C. Hess.

In: The Planning-Programming-Budgeting System: Progress and Potentials, Washington, The U.S. Government Printing Office, 1967, p 252-262.

Descriptors: *Government, *Budget, Social aspects, Statistics, Correlation, Decision making, Financing, Model studies, Research.
Identifiers: *Supplementals, *Allocation process, Non-defense agencies, Behavioral model, Expectations receipts, Unemployment.

A report is presented on the research concerning supplemental appropriations as one type of sources for funds for the agencies of the United States government. Relevant aspects of the allocation of these appropriations to non-defense agencies are presented in a summary of findings by Davis, Dempster and Wildavsky. Several alternative behavioral models of the process of making supplemental appropriations are presented, and various empirical tests of these models are presented. In addition, two models reflecting macro considerations are discussed in contrast to the micro-oriented models first presented. Factors affecting supplementals may properly be excluded from the regular budgetary process, since these determinates are so agency-specific that unexpected contingencies would have to be predicted to deal adequately with the supplementals. This article is relevant to government appropriations receptors, particularly those involved with federal water resource projects. (Murphy-Rutgers)
W71-09895

THE USE OF STANDARDS AND PRICES FOR PROTECTION OF THE ENVIRONMENT,

Princeton Univ., N.J.

For primary bibliographic entry see Field 05G.
W71-09900

6D. Water Demand

EXPLORING LAKE MICHIGAN WETLANDS,

Wisconsin Dept. of Natural Resources, Madison.

Bureau of Research.

Stanton J. Kleinert.

Wisconsin Conservation Bulletin, Vol 35, No 1,

Jan-Feb 1970, p 18 and 19, 3 fig.

Descriptors: *Wetlands, Wildlife conservation, Recreation demand, Cost-benefit analysis.
Identifiers: *Lake Michigan, Atkinson Marsh, Green Bay.

The beneficial features of lakeshore wetlands are explored and their usefulness for birds, fish, hunters, recreation and study are explained. With more appreciation for the role of wetlands, people are becoming more aware of the importance of preserving remaining wetlands. (Holmes-Rutgers)
W71-09487

CHARACTERISTICS OF HOUSEHOLD WATER CONSUMPTION IN THREE NEW HAMPSHIRE COMMUNITIES (APPENDIX),

New Hampshire Univ., Durham. Water Resources Research Center.

Richard A. Andrews, and Martha R. Hammond.

Research Report No 3, Statistical Appendix, December, 1970, 16 p, 17 ref, 3 append. OWRR Project A-018-NH (2).

Descriptors: *Water utilization, *Domestic water, *New Hampshire, *Water users, Water demand, Water costs, Lawns, Utilities, Water management (Applied), Water requirements, Cities.
Identifiers: *Household water consumption.

The purpose of this Appendix is to present a detail description of the study design and select estimated regression equations based on the highest R² with the most number of significant variables for use by professional workers in water resources fields. Several regression equations for each community are presented for evaluation of the results of the study and to provide alternatives in selection of a most usable equation for some defined purpose. It is felt that no one equation would serve all purposes or be of sufficient explanatory power for developing of confidence in the estimates obtained when applied to practical problems. Each community is treated separately due to an apparent 'community' or 'neighborhood' influence. The study was not designed to test for this influence on water consumption. Only for Durham and Epping is the 'neighborhood' effect even modestly identifiable in statistical analysis. To test for 'neighborhood' effect, more identifiable neighborhoods would be required along with more information about the neighborhood and its boundaries. (See also W71-08323)
W71-09563

DROUGHT AND WATER SUPPLY - IMPLICATIONS OF THE MASSACHUSETTS EXPERIENCE FOR MUNICIPAL PLANNING,

Resources for the Future, Washington, D.C.; and Pittsburgh Univ., Pa. Dept. of Geography; and Clark Univ., Worcester, Mass. Dept. of Geography. Clifford S. Russell, David G. Arey, and Robert W. Kates.

Research conducted under an RFF grant to Clark Univ. Baltimore, Maryland, The Johns Hopkins Press, 1970, \$8.00. 232 p, 29 fig, 56 tab, 8 append.

Descriptors: *Water supply, *Droughts, *Massachusetts, *Water resources development, *Municipal water, Model studies, Planning, Water demand, Water yield, Water costs, Water shortage, Water storage, Reviews, Forecasting.

The drought in Massachusetts of 1962-66 was studied to determine the adequacy of community water supply systems in terms of physical structure and operation, and the capacity of communities to adapt to drought conditions. The data developed were in turn used in a model depicting the efficient expansion of an existing water supply system. This study is part of a small but growing literature which explores society's ability to cope with natural hazards. In making explicit the service capacity of a water system under drought conditions, by considering the curtailment of water use as an investment, and by expressing 'losses' in dollar terms, important options for future water system planning are developed. (Woodard-USGS)
W71-09652

PRESENT OPERATIONAL PROBLEMS AND FUTURE WATER SUPPLY NEEDS IN ANKARA, TURKEY,

Camp, Dresser and McKee, Boston, Mass.

For primary bibliographic entry see Field 03D.
W71-09694

A WATER RESOURCE-WATER SUPPLY STUDY OF THE POTOMAC ESTUARY,

Environmental Protection Agency, Annapolis, Md.

Chesapeake Technical Support Lab.

For primary bibliographic entry see Field 05B.
W71-09788

THE WORLD OF WATER,

Minnesota Univ., Minneapolis.

For primary bibliographic entry see Field 06B.
W71-09870

AN APPROACH TO THE PROBLEM OF ESTIMATING DEMAND FOR PUBLIC GOODS,

Stockholm Univ. (Sweden).

Peter Bohm.

Swedish Journal of Economics, Vol 73, No 1, Mar 1971, p 55-66.

Descriptors: *Demand, *Government, *Environmental quality, Costs, Taxes, Prices, Waste treatment, Lakes, Swimming, Fishing, Uncertainty, Statistics, Population, Social aspects.
Identifiers: *Estimation, *Public goods, McGuire-Aaron model, Incentives, Willingness to pay, Credibility.

A method is suggested for estimating the demand for such public goods, as environmental quality, when the decision-makers are unaware of the maximum willingness to pay in relation to costs as well as the willingness to pay in different consumer groups. The method is developed because consumers do not reveal their true preference for such public goods. A simplified example of the proposed method is presented, utilizing the problem of demand for waste treatment facilities to render a polluted lake suitable for swimming and fishing. The problems of credibility and incentives to distorted demand are surveyed, as is the problem of selection of an appropriate population sample. The pure theory of public goods is then presented, including the McGuire-Aaron model, the supply of public goods, and policy costs. Finally, there is a treatment of the problem of selecting optimal procedures for estimation of demand for public goods. (Murphy-Rutgers)
W71-09887

6E. Water Law and Institutions

FLOOD DAMAGE ABATEMENT STUDY FOR VIRGINIA,

Virginia Polytechnic Inst., Blacksburg. Water Resources Research Center.

For primary bibliographic entry see Field 06F.
W71-09467

EQUITABLE ACCESS TO THE OCEAN'S WEALTH,

Food and Agricultural Organization of the United Nations, Rome (Italy).

Tony Loftas.

Ceres, Vol 3, No 5, p 34-38, Sept - Oct 1970. 3 figures.

Descriptors: *Oceans, Natural resources, Economics, International law, Political aspects.
Identifiers: *United Nations, UN Seabed Committee, Malta, 1958 Continental Shelf Convention.

The political and economic problems of exploitation and use of the oceans' resources has concerned the nations of the world for thousands of years. All marine problems are intimately related to one another. A new world body with independent means and legal powers could provide a solution to these international disputes. (Homes-Rutgers)
W71-09481

THE WATER RESOURCES PLANNING ACT OF 1965 AND FEDERAL-STATE COLLABORATION IN RESOURCE PLANNING,

Department of the Interior, Washington, D.C.

Henry P. Caulfield Jr.

Strategies for Western Regional Water Development, Proceedings of the Western Interstate Water Conference, Corvallis, Oregon, p 143-153, 1965. 4 ref, 2 tab.

Descriptors: *Water resources development, Project planning, Federal government, State governments, Administration.

Identifiers: *Gallatin, Calhoun, Land and Water Conservation Fund Act, Water Resources Council, Water Resources Planning Act.

The Water Resources Planning Act begins an opportunity for the federal government to work with the states in coordinating water planning and other related resources. It requires a joint comprehensive plan to be kept and coordinated on all levels of government by the commission which is the act's principal agency. (Campbell-Rutgers)
W71-09482

SHORELAND ZONING COMES TO WISCONSIN,

Wisconsin Dept. of Natural Resources, Madison. Bureau of Water and Shoreland Management. Robert M. Roden.

Wisconsin Conservation Bulletin, Vol 36, No 1, Jan-Feb 1971, p 10 and 11.

Descriptors: *Water law, Administration, Zoning, State governments.

Identifiers: *Wisconsin, Dodge County, Division of Environmental Protection, Water Resources Act, Natural Resources Board.

The Water Resources Act of Wisconsin requires all counties in the state, with the exception of Milwaukee County, to comply with stated standards for lot sizes, building setbacks from the water, protection of shoreland vegetative cover and controls over filling, grading, dredging, and lagooning of lakes and streams. The history and motivation for the legislation are reviewed, as well as the progress toward implementation. (Holmes-Rutgers)
W71-09486

PERMITS FOR WORK IN NAVIGABLE WATERS.

Federal Register, Vol 35, No 2, p 79-81 (Jan 1970). 3 p.

Descriptors: *Permits, *Navigable waters, *Structures, *Administrative agencies, Navigation, Water pollution, Water pollution control, Pollution abatement, Fish, Wildlife, Fish conservation, Wildlife conservation, Conservation, Environmental effects, Ecology, State governments, Local governments, Regulation, Adjudication procedure, Administration, Administrative decisions.

The Corps of Engineers has amended its regulations governing work to be performed in navigable waters. Issuance of permits must be based upon consideration of all relevant factors, including the effect of the proposed work on navigation, fish and wildlife, conservation, pollution, aesthetics, ecology, and general public interest. As to permits for construction of fixed structures on the Outer Continental Shelf, the decision will be based on the effect upon navigation and national security. However, even when the structure is unobjectionable, if state and local authorities decline to consent to the work, a permit will not be issued. In such cases the applicant will be informed that a permit would be issued if local consent were forthcoming. The amendment also provides detailed requirements for furnishing notice to the public and interested parties, and for consultation with interested parties. Requirements for public hearings and the procedures to be followed at such hearings are also set forth in detail. (Hart-Florida)
W71-09495

POWERS OF CITIES: WATER MANAGEMENT AND POLLUTION CONTROL.

Revised Code of Washington Ann secs 35.22.280, 35.23.440, 35.24.290 (1965).

Descriptors: *Washington, *Water pollution control, *Municipal water, *Cities, Water pollution, Water quality control, Pollution abatement, Public

health, Bridges, Bridge construction, Sewers, Streams, Lakes, Canals, Ponds, Ponding, Legal aspects, Legislation.

These sections enumerate the powers granted to cities of the first, second, and third classes. First and second class cities are empowered: (1) to control and punish pollution of all streams within five miles of their corporate limits, and of any stream or lake used for municipal water supply, within five miles of the source of supply; and (2) to clean and purify watercourses or drain and fill ponds on private property when they are offensive to the senses or dangerous to health. Third class cities are given jurisdiction over all sources of municipal water, both within and without the city limits, for the purpose of purification and pollution control, which may be effected by criminal ordinance. Second and third class cities are authorized to operate sewers, widen and improve waterways, and erect bridges. (Madson-Florida)
W71-09520

STUDY RELATING TO ENVIRONMENTAL POLLUTION.

Public Law No 91-515, sec 501, 84 Stat 1297, 13 US Code Cong and Admin News p 5350-5351 (1970). 2 p.

Descriptors: *Public health, *Air pollution effects, *Water pollution effects, *Pollution abatement, Pollutants, Air pollution, Water pollution, Water pollution control, Water pollution sources, Water pollution treatment, Federal government, Legislation, Legal aspects, Environment, Air environment, Safety, Environmental sanitation, Data collections.

The President shall initiate a study of the following: (1) the nature and gravity of the hazards to human health and safety created by air, water and other common environmental pollution; (2) medical and other assistance available to persons affected by such pollution, especially when such pollution reaches emergency levels; and (3) the measures, other than those relating solely to the abatement of pollution, that may be taken to avoid or reduce the effects of such pollution on the health of individuals. The President shall submit this report to Congress within nine months of the enactment of this Act. This report shall include the following: (1) his conclusions regarding the gravity of the hazards to human health, (2) his evaluation of the available medical assistance when pollution reaches emergency levels, (3) his assessment of the measures that may be taken to avoid or reduce the effect of pollution on health, and (4) legislative or other recommendations. This report shall be updated annually. (Robinson-Florida)
W71-09552

FINANCIAL RESPONSIBILITY FOR OIL POLLUTION CLEANUP.

Federal Maritime Commission, Washington, D.C.

Federal Register, Vol 35, No 190, p 15216-15221 (Sept 1970). 6 p.

Descriptors: *Oily water, *Damages, *Water pollution control, *Water quality control, Oil, Oil wastes, Legislation, Federal government, Administration, Administrative decisions, Administrative agencies, Legal aspects, Regulation, Pollution abatement, Water policy, Water pollution, Water pollution sources, Water quality, Navigable waters, Financing.

Identifiers: *Water Quality Improvement Act.

Pursuant to the Water Quality Improvement Act of 1970 the Chairman of the Federal Maritime Commission herein proposes regulations concerning financial responsibility for oil pollution cleanup. The regulations define many terms used by the Act. Public vessels shall include vessels owned or bareboat chartered by a state. All vessels whether oil free or not are encompassed by these regulations. Owners or operators may file applications and establish evidence of financial responsibility. Cor-

porate officers, personal owners, operators, and partners need not submit evidence of their authority to sign the application. An owner or operator may establish financial responsibility by insurance, surety bonds, guarantees, or self insurance. Deductible provisions in insurance policies are acceptable if the applicant evidences supplemental coverage for the deductible amount. Each vessel will be covered by a separate certificate of financial responsibility. No vessel over 300 gross tons shall use any port or navigable waters of the United States unless a certificate of financial responsibility has been issued covering such vessel. The procedures and methods of establishing financial responsibility are detailed in these regulations. Grounds for denial, revocation, or suspension of a certificate are also specified. (Robinson-Florida)
W71-09564

CONTRA COSTA COUNTY AND THE PERIPHERAL CANAL.

Contra Costa County Water Agency, Martinez, Calif.

For primary bibliographic entry see Field 06G.

W71-09579

ENVIRONMENTAL STATEMENT ON THE PROPOSED ELECTRIC POWER ENVIRONMENTAL POLICY ACT.

Federal Register, Vol 35, No 205, p 16440-16448 (Oct 1970). 9 p.

Descriptors: *Electric power demand, *Environmental effects, *Administrative agencies, *Powerplants, Administrative decisions, Regulation, Federal government, State governments, Legal aspects, Legislation, Planning, Engineering structures, Nuclear powerplants, Electric powerplants, Thermal powerplants, Hydroelectric plants, Electrical engineering, Environment, Environmental engineering, Water pollution, Water utilization, Water supply, Electric power.

Pursuant to the requirements of the National Environmental Policy Act the Federal Power Commission submits for comment a statement evaluating the environmental impact of the proposed Electric Power Environmental Policy Act, which is designed to ensure adequate electrical power supplies for the nation by facilitating the timely construction of generating facilities. The basic objective of the proposed act is the achievement of harmony between adequate power supplies and environmental protection. Public and private electric entities will have to acquire certification of powerplants and lines well in advance of construction. State or regional certification of sites and facilities will be required except for those facilities owned or operated by the federal government. If state agencies fail to take action the Federal Power Commission will exercise the certification responsibility. Certification will be granted when it appears that there is a valid need for power and that neither public health and safety nor ecological systems will be irreparably harmed. The Federal Power Commission will be authorized to delegate to the Atomic Energy Commission the certification of nuclear facilities. (Robinson-Florida)
W71-09589

UNITED STATES V VULCAN MATERIALS CO (POLLUTION PROSECUTION UNDER THE NEW YORK HARBOR ACT).

320 F Supp 1378-1381 (D NJ 1970).

Descriptors: *New Jersey, *Pollution abatement, *Water pollution control, *Water quality control, Federal government, Legislation, Judicial decisions, Legal aspects, Pollutants, Water policy, Water pollution, Water quality, Harbors, Industrial wastes, Oil wastes, Acids, Alkalis (Bases), New York.

The United States prosecuted defendant manufacturers for discharging acid, alkaline, and oil waste

Field 06—WATER RESOURCES PLANNING

Group 6E—Water Law and Institutions

into New York Harbor in violation of the New York Harbor Act. The substances discharged by defendant were liquid and entered the water by a sewer line. Defendant contended that the discharge was permitted by the statute, since the statute only applied to discharges which would be navigational obstructions. Defendant argued that the Federal Water Pollution Control Act impliedly repealed the New York Harbor Act. Other contentions of defendant were: (1) it was unfair to prosecute defendant when New Jersey had instituted civil proceedings against them, (2) defendant had expended 'millions' to correct the problem, and (3) defendant was taking appropriate steps to remedy the situation. Defendant's motion to dismiss was denied by the federal district court. Discharge of acids, alkalines, and oil is in violation of the statute, since the statute contemplates organic matter which will decompose. The Federal Water Pollution Control Act does not repeal the New York Harbor Act. A defendant's expenditures and efforts do not exempt him from criminal prosecution, nor does the fact that civil proceedings have been instituted against him. (Robinson-Florida)
W71-09660

ESTABLISHING THE ENVIRONMENTAL QUALITY COUNCIL AND THE CITIZENS ADVISORY COMMITTEE ON ENVIRONMENTAL QUALITY,

Richard M. Nixon.

Exec Order No 11472, Code of Federal Regulations, Title 3, Chap II, p 122-125 (1969 Compilation). 4 p.

Descriptors: *Environment, *Administrative agencies, *Environmental effects, *Federal project policy, Federal government, State governments, Local governments, Administration, Water pollution, Water pollution control, Water pollution sources, Pollutants, Pollution abatement, Regulation.

The Environmental Quality Council, consisting of the President, Vice-President, and the Secretaries of Agriculture, Commerce, HEW, HUD, Interior, and Transportation, is formed to advise and assist the President on environmental quality matters, including: (1) recommendation of measures to ensure that federal policies and projects take adequate account of environmental effects; (2) review of the adequacy of existing systems for monitoring and predicting environmental changes; (3) encouragement of federal, state, and local cooperation; (4) stimulation of public and private participation in programs to prevent and abate pollution; (5) encouragement of technological development to prevent adverse environmental effects; (6) encouragement of timely disclosure of plans affecting environmental quality; (7) assessment of new technologies for their potential environmental effects; and (8) facilitation of coordination among federal administrative agencies in protecting the environment. Additionally, the Council shall review plans of federal agencies affecting outdoor recreation and natural beauty. The Citizens' Advisory Committee on Environmental Quality has 14 members, who shall advise the President and the Council on the duties assigned to the Council. (Hart-Florida)
W71-09663

WESTERN WATER ORGANIZATION AS A POLITICAL PHENOMENON,

Colorado Univ., Boulder.

Conrad L. McBride.

Proceedings of the Western Interstate Water Conference, Strategies for Western Regional Water Development, Corvallis, Oregon, 1965, p 170-174. 2 ref.

Descriptors: *Water resources development, *Decision making, *Political aspects, *Institutional constraints.

Identifiers: *Report of the Task Force on Water Resources, Upper Colorado River Compact.

The article discusses the lack of clear cut scientifically developed policy in the field of water resources development. However, he questions whether under our system of government public policy needs to be that well defined. He argues that the proliferation of water resource organizations, some of which repeat one another's efforts, creates a healthy situation and allows for compromise. (Holmes-Rutgers)
W71-09684

INTERSTATE SANITATION COMMISSION—POWERS.

Public Act No 7, Connecticut Legislative Service, p 6-7 (1969). 2 p.

Descriptors: *Connecticut, *Interstate compacts, *Interstate commissions, *Water quality control, Tidal waters, Legislation, Water policy, Water pollution control, Water pollution, Water purification, Water quality, Pollution abatement, Pollutants, Waste disposal, Waste water (Pollution), Biochemical oxygen demand, Effluents, Solid wastes, Liquid wastes.

The signatory states of the Interstate Sanitation Commission agree that no sewage or pollutants shall be allowed in the tidal waters of the district unless the following conditions and restrictions are met. All sewage discharged into class 'A' waters shall be treated as follows: (1) all floating solids and 60% of suspended solids shall have been removed, (2) intestinal bacilli shall be reduced to not more than one per cubic centimeter in more than 50% of sewage effluents tested, and (3) average dissolved oxygen of not less than 50% saturation shall be maintained. Sewage discharged into class 'B' waters must have all floating solids and 10% of suspended solids removed, and the average dissolved oxygen content must be not less than 30% saturation. Other classifications of waters and effluent standards may be developed, after public hearing, in addition to or in substitution of those set forth in this Article or Article VI of the compact. Any such additional or substitute classifications and standards shall take effect when the states of New Jersey and New York have similarly amended the tri-state compact. (Robinson-Florida)
W71-09688

USE OF CHEMICALS, MATERIALS OR TECHNIQUES TO TREAT OIL SPILLS (MASSACHUSETTS POLICY STATEMENT).

Massachusetts Div. of Water Pollution Control, Boston.

Commonwealth of Massachusetts, Division of Water Pollution Control, Publication No 5394, nd. 7 p, 1 append.

Descriptors: *Massachusetts, *Chemcontrol, *Oily water, *Administrative agencies, Water pollution sources, Water pollution treatment, Commercial shellfish, Freshwater fish, Saline water fish, Fish-kill, Pollution abatement, Abatement, Water pollution.

The Massachusetts Department of Water Pollution Control has established a policy with regard to the chemical treatment of oil spills. While physical and mechanical means are expressly favored, floating non-toxic insoluble chemical absorbents may be used without restriction. Use of chemical dispersants is discouraged; they may only be used under restricted conditions and with the prior approval of the Department. The restrictions are consistent with those contained in the National Oil and Hazardous Materials Pollution Contingency Plan. The use of chemical sinking agents is prohibited. Telephone numbers are listed for the reporting of oil spills. An appendix contains an analysis of the tolerance of fresh and salt water fish to particular commercial brands of dispersant chemicals. (Kohla-Florida)
W71-09689

AD VALOREM TAX EXEMPTION FOR ANTI-POLLUTION DEVICES, SYSTEMS AND FACILITIES.

Act No 1137, Acts of Alabama, p 2123-2126 (1969). 4 p.

Descriptors: *Alabama, *Taxes, *Pollution abatement, *Treatment facilities, Assessments, Land appraisal, Tax rate, Water pollution, Air pollution, Water quality control, Water pollution treatment, Government finance, State governments, Industries, Legislation, Legal aspects.
Identifiers: *Tax exemptions.

A prior act providing for certain exemptions from state ad valorem taxation is hereby amended to include exemptions for anti-pollution devices. All devices, systems or facilities constructed, used, or placed in operation primarily for the protection of the public interest through the abatement of air and water pollution shall be exempt from state ad valorem taxation. (Smiljanich-Florida)
W71-09692

GOVERNMENTAL RESPONSIBILITIES FOR WATER DEVELOPMENT,

Oregon State Univ., Corvallis.

James H. Jensen.

Proceedings of the Western Interstate Water Conference, Strategies for Western Regional Water Development, Corvallis, Oregon, 1965, p 116-124. 2 ref.

Descriptors: *Water resources development, *Project planning, *Economic feasibility, State governments.

Identifiers: *Oregon State University, Willamette Basin Study, Puget Sound Study, Columbia Basin Survey.

This article describes the role that states can and should play in planning water resource development. By citing several examples of studies carried out at Oregon State University the author illustrates the constructive role of states. Instead of commenting on a study completed by a federal agency, a state can make a more positive contribution by conducting a study of its own. (Holmes-Rutgers)
W71-09696

STATE CERTIFICATION OF ACTIVITIES REQUIRING FEDERAL LICENSE OR PERMIT.

Federal Register, Vol 36, No 25, p 2516-2518 (Feb 1971). 3 p.

Descriptors: *Administrative agencies, *Permits, *Water pollution control, *Navigable waters, Pollution abatement, Water pollution, Water pollution sources, Administration, Regulation, Discharge (Water), Sediment discharge, State governments, Interstate commissions.

Identifiers: *Water Pollution Control Act.

The Federal Water Pollution Control Act requires applicants for a federal license to conduct activity which may result in discharges into navigable waters of the United States to obtain certification that such activity will not violate applicable water quality standards. Proposed rules to regulate certification are in four parts. Part A provides definitions of general applicability for the regulations and rules governing uniform content and form of certification. Part B establishes procedures for determination by the Administrator as to whether a discharge may affect the quality of waters of a state other than the state where the discharge originates. Part C establishes procedures for certification by the Administrator where standards have been promulgated by him, and where no state or interstate agency has authority to certify that there is reasonable assurance that the activity resulting in discharges will be conducted in a manner not violating water quality standards. Part D provides for consultation between the Administrator and federal licensing and permit-issuing agencies with respect to the meaning, content, and application of

water quality standards and related matters. (Hart-Florida)
W71-09698

CERTIFICATION OF FACILITIES FOR WATER POLLUTION CONTROL.

Code of Federal Regulations, Title 18, Chap V, part 602 (1970). 3 p.

Descriptors: *Water pollution control, *Treatment facilities, *Administrative agencies, *Taxes, State governments, Local governments, Administrative decisions, Regulation, Water treatment, Waste treatment.

Under section 48 of the Internal Revenue Code, the Secretary of the Interior certifies facilities for purposes of the section 38 depreciation deduction. Regulations governing certification are contained in this publication. After defining various terms, general provisions for filing and routing of applications are set forth. If the certification is refused, the applicant must be informed of the reasons for refusal. Next, the information required in the application is delineated. No application will be approved by the Secretary unless it is accompanied by a state certification that the facility conforms to state requirements for water pollution control. The general policies of the United States for cooperation with the states in prevention and abatement of water pollution are also promulgated. A facility will be certified if the Secretary determines that it complies with these regulations, regulations of other agencies, and the general policies. Five factors are to be considered by the Secretary in his determination: (1) water quality standards and implementation plan; (2) recommendations issued pursuant to the Federal Water Pollution Control Act; (3) state pollution control programs; (4) comprehensive pollution controls under section 3 of the Water Pollution Control Act; and (5) local standards for water pollution control. (Hart-Florida)
W71-09699

NOTICE OF A MEMORANDUM OF UNDERSTANDING PROVIDING FOR COOPERATION IN THE INVESTIGATION OF VIOLATIONS OF THE REFUSE ACT.

Department of the Army, Washington, D.C.

Federal Register, Vol 36, No 32, p 3074-3075 (Feb 1971). 2 p.

Descriptors: *Water pollution control, *Administrative decisions, *Water quality control, *Pollution abatement, Federal government, Federal jurisdiction, Regulation, Administration, Administrative agencies, Legal aspects, Water policy, Water pollution, Water quality, Interstate rivers, Navigable waters, Pollutants, Permits.
Identifiers: *Refuse Act.

Pursuant to the Refuse Act and the Federal Water Pollution Control Act a memorandum of understanding between the Department of the Army and the Environmental Protection Agency (EPA) is promulgated to provide for cooperation in the investigation of violations of the Refuse Act. The Department of the Army has primary responsibility for enforcement of the Refuse Act, and the EPA has primary responsibility for the control of pollution of interstate and navigable waters. Persons desiring to deposit refuse in navigable waters will be required to obtain a permit from the Department of the Army. One who discharges wastes into such waters without a permit may be subjected to legal proceedings. When a District Engineer believes that a discharge has occurred having an adverse effect on water quality he shall notify the Regional Representative of the EPA. If the Regional Representative believes that there has been an adverse effect on water quality he shall submit a report to the District Engineer. If a refuse permit is suspended the District Engineer shall notify the Regional Representative. If legal action is deemed necessary the appropriate United States attorney should be notified. (Robinson-Florida)

W71-09700

CONTROL OF POLLUTION BY OIL AND HAZARDOUS SUBSTANCES, DISCHARGE REMOVAL.

Coast Guard, Washington, D.C.

Federal Register, Vol 36, No 71, p 7009-7011 (Apr 1971). 3 p.

Descriptors: *Water pollution control, *Administrative agencies, *Oil wastes, *Government finance, Federal government, Legal aspects, Regulation, Administration, Administrative decisions, Water pollution, Water pollution treatment, Oil, Oily water, Water pollution sources, Water policy, Pollution abatement, Financing, Legislation.
Identifiers: *Water Pollution Control Act, *Water Quality Improvement Act.

Pursuant to the Federal Water Pollution Control Act, as amended by the Water Quality Improvement Act of 1970, the Commandant of the Coast Guard promulgates regulations dealing with control of pollution by oil and other hazardous substances. The Act provides for the establishment of a fund which may be used to pay the following: (1) costs for phase II and III actions under the National Contingency Plan; (2) judgments, compromises, and settlements; and (3) any other costs deemed proper by the Commandant. However, the fund may not be used to pay the costs of removing oil discharged from United States public vessels or facilities. Requests for payment must be made in accordance with the Regional Contingency Plan. Claims asserted shall be in accordance with the Federal Claims Collection Act of 1966. The Commandant shall deposit in the fund monies received by the United States from: (1) payment of fines under the Act, (2) payment of civil penalties under the Act, (3) payments as a result of demand for payment or in compromise or settlement of an action brought under section 11 (f) and (g) of the Act, and (4) payments in satisfaction of judgments obtained under the Act. (Robinson-Florida)
W71-09701

A BILL TO CONSENT TO THE INTERSTATE ENVIRONMENT COMPACT.

Senate Bill 907, 92d Cong., 1st Sess (1971). 10 p.

Descriptors: *Interstate compacts, *Environmental sanitation, *Water pollution control, *Pollution abatement, Legal aspects, Legislation, Federal government, State governments, Environment, Water pollution, Wastes, Waste disposal, Waste treatment, Water pollution treatment, Water policy, Water quality, Water quality control, Water treatment.

Because environmental pollution problems transcend state boundaries this bill would provide congressional consent for any two or more states to enter into the Interstate Environment Compact. Nothing in the Compact would impair or extend the Constitutional authority of any signatory state or the United States. Signatories would be authorized to participate with the federal government in interstate environmental protection. Other existing governmental arrangements not primarily directed to environmental protection would not be affected. Supplementary agreements may be made by the signatories. Nothing herein would diminish or supersede existing interstate compacts. This compact would not affect future multistate compacts not in conflict. Signatories would be allowed to enter into special supplementary agreements with the District of Columbia or foreign nations for the same purposes as those of the compact if the non-signatories accept the general obligations of the Compact. This Compact does not affect the authority of signatories to enact environmental legislation not inconsistent with it. The provisions of the Compact would be severable. States would be allowed to withdraw one year after written notice to the other signatories. Amendments would be effective when approved by all signatories and Congress. (Robinson-Florida)

W71-09702

GREAT LAKES BASIN CONSERVATION ACT (A BILL TO AMEND THE SOIL CONSERVATION AND DOMESTIC ALLOTMENT ACT TO PROVIDE FOR A GREAT LAKES BASIN CONSERVATION PROGRAM).

Senate Bill 1156, 92d Cong, 1st Sess (1971). 6 p.

Descriptors: *Soil conservation, *Water conservation, *Contracts, *Adoption of practices, Federal government, Economics, Erosion control, Land management, Land resources, Project purposes, Water resources development, Pollution abatement, Agricultural engineering, Farm management, Administrative agencies, Land use, Erosion, Government finance.

Under this proposed amendment to the Soil Conservation and Domestic Allotment Act, entitled the Great Lakes Basin Conservation Act, the Secretary of Agriculture is authorized to contract with landowners to share the cost of alterations in cropping systems and land use in order to conserve soil and water resources. The landowner furnishes the plan of farming operations, which should incorporate maximum practicable soil and water conservation principles, and outlines the schedule of proposed changes. The plan shall include measures for fish and wildlife conservation, promoting economic land use, and reducing agricultural pollution, to the extent practicable. Under the contract, the landowner must agree: (1) to effectuate the plan; (2) to forfeit further payments for breach; (3) to forfeit further payments upon alienation, unless the new owner assumes the contract obligations; (4) not to adopt practices contravening the plan; and (5) to accept additional provisions desired by the Secretary. By mutual agreement, the contract may be terminated. In addition, state and local conservation programs are to be considered in making the contract. (Hart-Florida)
W71-09703

DEEP OCEAN DUMPING OF BALED REFUSE.

US Government Printing Office, Washington, DC, National Industrial Pollution Control Council, Sub-Council Report (Feb 1971). 15 p.

Descriptors: *Cities, *Oceans, *Waste disposal, *Environmental effects, Degradation (Decomposition), Municipal wastes, Sanitary engineering, Sludge disposal, Federal government, Research and development, Wastes.

No comprehensive studies on the effect of refuse dumping on the ocean environment have been completed. Although a recent report points out the danger of continued uncontrolled dumping, it does not recommend development of systems for safe exploitation of the enormous absorptive capacity of the oceans. Furthermore, no long-term tests have been conducted on the behavior of municipal solid waste on the ocean floor which measure chemical or biological degradation rates or the effects of such wastes on the environment. The known serious offenders of ocean pollution are sewage sludge, industrial chemical waste, and oil spillage. Municipal refuse does not contain nutrients characteristic of sewage or toxic elements characteristic of industrial chemical wastes. Moreover, municipal refuse may be compressed into bales for depositing into deep ocean sites where biological activity is minimal. However, baled refuse might float initially or interfere with biological systems in the ocean. The United States should begin a series of experiments to develop acceptable methods for disposal of municipal refuse in the oceans to alleviate pressing municipal refuse problems. (Hart-Florida)
W71-09704

STATE CERTIFICATION OF ACTIVITIES REQUIRING A FEDERAL LICENSE OR PERMIT.

Environmental Protection Agency, Washington, D.C.

Field 06—WATER RESOURCES PLANNING

Group 6E—Water Law and Institutions

Federal Register, Vol 36, No 90, p 8563-8565 (May 1971). 3 p.

Descriptors: *United States, *Water pollution control, *Standards, *Permits, Legal aspects, Regulation, Administrative agencies, Federal government, Water rights, Administration, Inspection, Water resources development, Water pollution effects, State governments, Environmental effects, Water conservation, Water quality control, Water resources, Pollution abatement, Water pollution sources, Water law.

Any applicant for a federal permit to conduct an activity that might result in any discharge into the navigable waters of the United States is required to obtain certification from the appropriate agency that the activity will not violate applicable water quality standards. The Regional Administrator of the Environmental Protection Agency shall review applications for permits and certifications to determine if discharges might affect the water quality of another state. If he determines that there would be such an effect, he shall notify the other state, which may object to the granting of the permit. The Administrator shall give certification when: (1) he has promulgated the applicable standards, or (2) the state has not delegated authority to give such a certification even though it has set up its own standards. Certification by the Regional Administrator shall be given only after proper notice and hearing. A Regional Administrator shall be allowed to inspect facilities certified in connection with issuance of a permit for construction. Any violation of the standards appearing at this inspection may be brought before the issuing agency to decide if the permit should be suspended. (Johnson-Florida) W71-09705

CLEAN WATERS FOR AMERICA WEEK, 1971, Richard M. Nixon. Proclamation 4049, Federal Register, Vol 36, No 86, p 8289-8290 (May 1971). 2 p.

Descriptors: *United States, *Water pollution, *Water policy, *Water resources development, Legal aspects, Federal government, Social aspects, Environmental effects, Natural resources, Water resources, Water utilization, Water quality, Water treatment, Water pollution treatment, Pollution abatement, Water quality control, Water shortage, Water requirements.

One of America's greatest challenges in the 1970s will be ending the wasteful and destructive practices which have so seriously degraded our environment. Americans have taken our natural resources for granted, confident that our land would provide enough good water for every need. The truth is that we have uncovered no new sources of fresh water for many years. At the same time, population growth and technological advances have tremendously increased both the overall and the per capita consumption of water, while inadequate treatment of wastes has contaminated more and more of our water resources. Quick and effective action is required to protect our waters from further deterioration and to treat wastes so that water may be used again. President Nixon designates the week beginning May 2, 1971, as Clean Waters for America Week. All Americans are urged to observe this week with appropriate ceremonies, activities, and educational programs. We are also encouraged to support governmental efforts to clean up our national waterways and to adopt new habits and practices which will contribute to the enhancement of water quality in this country. (Johnson-Florida) W71-09706

BASS ANGLER SPORTSMAN SOC'Y V UNITED STATES STEEL CORP (PRIVATE PARTY LACKS RIGHT TO ENFORCE ANTI-POLLUTION PROVISIONS OF RIVERS AND HARBORS ACT). 324 F Supp 412-417 (D Ala 1971).

Descriptors: *Alabama, *Rivers and Harbors Act, Pollution abatement, *Water pollution control, Water pollution, Water quality control, Navigable waters, Navigable rivers, Judicial decisions, Water law, Legal aspects, Remedies.

Plaintiff society sued various corporate and government defendants, seeking the imposition of fines for violation of the Rivers and Harbors Act of 1899 and to enjoin further violations. The Act proscribes dumping of refuse matter into navigable waterways and provides for imprisonment and fine, one half of which may be paid to the person giving information leading to conviction. Plaintiff contended that this latter provision entitled it to maintain an action to enforce the Act. On consolidated hearing, the United States District Courts for the Northern, Middle, and Southern Districts of Alabama granted defendants' motions to dismiss. The courts held that a private party had no right to enforce a criminal fine by civil action, and that injunction is not the proper remedy for enforcement of the criminal law. (Madsen-Florida) W71-09707

ENVIRONMENTAL DEFENSE FUND INC V CORPS OF ENGINEERS (INJUNCTION HALTING CONSTRUCTION OF BARGE CANAL). 324 F Supp 878-883 (DDC 1971).

Descriptors: *Florida, *Canal construction, *Environmental effects, *Ecosystems, Balance of nature, Water pollution, Wildlife conservation, Water conservation, Aesthetics, Scenery, Water pollution effects, Ecology, Rivers, Natural resources, Water resources development, Recreation, Hunting, Fishing, United States, Federal government, Organizations, Administrative agencies, Legislation, Adjudication procedure, Legal aspects, Judicial decisions. Identifiers: *Cross-Florida Barge Canal.

Plaintiff conservationist organizations sought preliminary injunctive relief against the Army Corps of Engineers to prevent further construction on the Cross-Florida Barge Canal. Plaintiffs contended that the Canal was being built in violation of statutes designed to preserve natural resources, and that unless the relief was granted, irreparable damage would result to the Oklawaha River ecosystem, including destruction of wildlife and water pollution. Defendant contended that plaintiffs lacked standing to sue, that the government was immune through the doctrine of sovereign immunity, and that the statutes did not apply to the Canal. The United States District Court, in granting the preliminary injunction, noted that public conservationist groups have a sufficient interest in environmental values to have standing to sue as representatives of the public interests involved. The doctrine of sovereign immunity was inapplicable because plaintiffs alleged that the government was acting beyond its statutory authority and that the exercise of authority was constitutionally void. Plaintiffs sufficiently alleged violations of various statutes designed to protect the environment. Further work on the Canal was temporarily halted to prevent irreparable harm to the environment. (Smiljanich-Florida) W71-09708

TOWARD A CONSTITUTIONALLY PROTECTED ENVIRONMENT.

Virginia Law Review, Vol 56, p 458-486 (1970). 29 p, 124 ref.

Descriptors: *Legal aspects, *Judicial decisions, *Environment, *Public rights, Legislation, Adjudication procedure, Rivers and Harbors Act, Water Quality Act, Federal government, State governments, Public health. Identifiers: *Constitutionality.

The recent public awareness of environmental degradation has generated a search for a constitutional means of protecting the environment. Although no express constitutional provision pro-

tecs the environment, the Supreme Court in *Griswold v. Connecticut* found a constitutional right to privacy in the penumbra of the Bill of Rights, or as part of the due process clause. Constitutional protection of the environment might be found as in *Griswold*, through interpretation of the Ninth Amendment. Also, environmental rights could be recognized as another facet of the developing 'right to be let alone', expanding the scope of individual constitutional protection to include integrity of natural surroundings. The public's environmental rights have also been protected through court construction of federal legislation. Although a constitutional right to an environment cannot be explicitly defined, the public should be protected from 'unreasonable' environmental degradation. Three obstacles exist to asserting the right of environmental protection: (1) state action within 42 U.S.C. 1983; (2) lack of justiciability of the controversy; and (3) difficulty in framing an adequate decree. Judicial recognition of constitutional environmental rights is necessary for effective environmental protection. (Hart-Florida) W71-09709

THE 'FINAL' WATER WELL LAW AND REGULATIONS, National Water Well Association, Urbana, Ill. Manufactures Div. D. Fumes. Water Well Journal, Vol 20, No 1, p 57-68, January 1966, 1 tab.

Descriptors: *Legislation, *Well regulations, *Water wells. Identifiers: *Water well construction standards, Pump installation standards, Water well construction and pump installation act, Abandoned wells, Grouting, Disinfection.

The water well industry, in general, is under increasing pressure. It has been told that individual wells are 'unsafe' offer a health hazard.....are not regulated and supervised like central water supplies. The author admits that to some extent the accusations are true. Few states have effective licensing laws to keep practices at a high level. Even fewer states have effective control over how wells are constructed or how pumps are installed. It is to put an end to such charges that the water well law was developed. It is designed to protect public health. The sponsors feel that it will up-grade our industry by forcing contractors to meet higher standards than are sometimes the case and by forcing all contractors to do an adequate job. The law should benefit both the public and the well contractor. The law was developed by the Industry Committee for Private Water Resource Protection and was sponsored by the American Institute, Central Supply Association, National Water Well Association and the Water Systems Council. The laws represents a consensus reached by over 100 drilling contractors, pump installers throughout the country and has been endorsed by the Public Health Service, the Conference of State Sanitary Engineers and the American Public Health Association. (Campbell-NWWA) W71-09723

WYOMING WATER AND THE MINERAL INDUSTRY, THE LAW, THE PROBLEMS, AND SOURCES OF INFORMATION, Wyoming State Engineer's Office, Cheyenne. S. H. Ross. 22nd Annual Field Conference - September 21-23, 1970, Casper, Wyoming: Wyoming Geological Association Guide Book, 292 p.

Descriptors: *Wyoming, *Legislation, Groundwater, Drilling, *Water wells, Waste disposal. Identifiers: *Mining industry, Water rights, Pollution, Solution mining potential pollution.

Because of an ever-increasing interest in Wyoming's water resources, especially groundwater resources, this paper has been written to acquaint water users (and potential water abusers)

with this vital resource. Emphasis is on (1) the history of water usage and water legislation; (2) water laws as they apply to industry, especially the extractive mineral industry, today; (3) problems caused by continued exploitation of both groundwater and mineral resources that lie within and below usable groundwater deposits; and (4) sources of information on groundwater in Wyoming. This paper is especially well written and well referenced. (Campbell-NWWA)
W71-09727

THE VALUE OF STATE GROUNDWATER AGENCIES TO THE SMALL WATER WELL CONTRACTOR,
Ohio Div. of Water, Columbus.
A. C. Walker.
Groundwater, Vol 1, No 1, p 4-7, January 1963, 12 fig.

Descriptors: *Water wells, Groundwater, Drilling.
Identifiers: *State groundwater agencies, *Water well contractor, Cooperation, Pollution control well logs, Information exchange.

It is the State's responsibility to see that its groundwater resources are developed with as little 'red tape' as possible. The well driller's responsibility is to his customers. Both State groundwater agencies and water well drillers can carry out their responsibilities best by working together. Such cooperation can eliminate unnecessary drilling regulations and result in better wells through exchange of information. In many instances, overdevelopment or contamination of an aquifer could have been avoided if drillers and States had worked together, rather than in opposite directions. (Campbell-NWWA)
W71-09728

REGULATIONS PERTAINING TO ISSUANCE OF A PERMIT.
Missouri Water Pollution Board.

Missouri Water Pollution Board, Jefferson City, 65101 (1967). 5 p.

Descriptors: *Missouri, *Permits, *Administrative agencies, *Regulation, Control, Water pollution control, Inspection, Testing, Industrial wastes, Sewage treatment, Water treatment, Administration, Pollution abatement, Water pollution treatment, Water quality control, On-site investigation, Sewage disposal, Treatment facilities, Waste water treatment, Waste treatment, Water policy.

The Water Pollution Board is empowered to issue permits to all persons operating any system for the collection, treatment, or disposal of sewage, industrial waste or other waste into the waters of the state. Permits shall specify the conditions at the time of issuance and shall be designed to carry out the purposes of the State Water Pollution Act. No person shall erect, modify, commence, or operate any such system without first securing the appropriate construction or operating permit from the Board. Construction permits are granted only after the Board has examined and approved both the preliminary engineering report and the final plans for operation. Operating permits are granted after examination by the Board to determine that the completed work adheres to the approved plans. All plants shall be inspected periodically by representatives of the Board. (Horwitz-Florida)
W71-09744

CURRENT CONSERVANCY LEGISLATION,
Iowa House of Representatives, Des Moines.
For primary bibliographic entry see Field 05G.
W71-09762

POLLUTION CONTROL DECISIONS - WHO SHOULD MAKE THEM,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-09763

NAVIGABLE WATERS POLLUTION CONTROL ACT OF 1965 (A BILL TO PROVIDE FOR THE ESTABLISHMENT OF REGULATIONS FOR THE PURPOSE OF CONTROLLING POLLUTION FROM VESSELS AND OTHER SOURCES IN THE NAVIGABLE WATERS OF THE UNITED STATES).

Senate Bill 1908, 89th Cong, 1st Sess (1965). 12 p.

Descriptors: *Navigable waters, *Water pollution control, *Ships, *Regulation, Administrative agencies, Water pollution, Water quality, Water quality control, Legislation, Oil, Legal aspects, Oily water, Waste disposal, Wastes, Pollution abatement, Abatement.
Identifiers: *Refuse Act of 1899, *Oil Pollution Act.

The Navigable Waters Pollution Control Act of 1965 proposed in this Senate bill endeavors to expand and improve existing law and provide authority to establish regulations controlling pollution in navigable waters of the United States. Various administrative agencies are authorized to establish regulations concerning equipment and facilities and treatment and disposal of oil, sewage, and refuse from vessels in navigable waters of the United States. The Coast Guard is responsible for implementing the regulations. A technical committee will be appointed to formulate the regulations. The 1924 Oil Pollution Act is amended by providing new definitions, making discharge of oil unlawful except during emergencies, and establishing liability for removal of all oil discharged. Penalties for violation are prescribed. The Coast Guard may suspend or revoke licenses for violation of the Act. The 1961 Oil Pollution Act is amended making violation of certain provisions a misdemeanor and establishing penalties. Enforcement of its provisions will also be by the Coast Guard. The Refuse Act of 1899 is amended to provide that the Coast Guard shall administer its provisions. (Hart-Florida)
W71-09766

DOW SUED BY ONTARIO FOR POLLUTION DAMAGE.
For primary bibliographic entry see Field 05C.
W71-09784

A BILL TO AMEND THE INTERNAL REVENUE CODE OF 1954 TO ENCOURAGE THE ABATEMENT OF WATER AND AIR POLLUTION BY PERMITTING AMORTIZATION OF THE COST OF ABATEMENT WORKS.

Senate Bill 1670, 89th Cong, 1st Sess (1965). 8 p.

Descriptors: *Taxes, *Pollution abatement, *Water pollution control, *Amortization, Air pollution, Water pollution, Administrative agencies, State governments, Federal government, Legal aspects, Non-structural alternatives, Financing, Depreciation, Facilities.

Abatement of air and water pollution would be encouraged under this Bill, which adds section 183 to the internal Revenue Code of 1954, by permitting amortization of the cost of abatement works over a 36 month period. Any taxpayer may elect to amortize abatement works on the straight-line method not later than the time for filing in the year in which the Secretary of Health, Education, and Welfare (HEW) certifies the abatement works. Performance standards for abatement works will be established by HEW. When the state certifying authority has certified to HEW that state standards have been met, and HEW has certified to the Secretary that minimum HEW standards are satisfied, the works qualify for amortization. However, HEW may not certify works for the extent to which the profits from abatement works will be sufficient to recover its cost over its actual useful life. The basis of abatement works shall be allocated between certified and non-certified portions of the works. Other sections of the Code are modified as required. (Hart-Florida)
W71-09785

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT IN ORDER TO ESTABLISH A PROGRAM TO DECREASE WATER POLLUTION BY SYNTHETIC DETERGENTS.

Senate Bill 1479, 89th Cong, 1st Sess (1965). 5 p.

Descriptors: *Pollution abatement, *Water pollution control, *Detergents, *Degradation (Decomposition), Water pollution sources, Water quality, Water quality control, Soaps, Chemical wastes, Domestic wastes, Legislation, Administrative agencies, Pollutants, Administrative decisions, Administration, Federal government, Regulation.

A program to decrease water pollution caused by use of synthetic detergents which do not decompose or which decompose slowly would be established by this proposed amendment to the Federal Water Pollution Control Act. Efforts to develop fast-decomposing detergents are encouraged through liaison with detergent manufacturers. Standards of bio-degradability will be developed by the Secretary of Health, Education and Welfare, with the assistance of a technical committee composed of members from various sources. The decomposability standards will be developed from tests simulating municipal sewage treatment and household waste treatment. The Secretary is authorized to promulgate rules prohibiting sale or transport in interstate commerce of detergents failing to meet the decomposability standards. Furthermore, rules may be established which prohibit importation of detergents not meeting the standards. Violation of these rules is a misdemeanor, punishable by fine. (Hart-Florida)
W71-09786

ESCAROSA: A PRELIMINARY STUDY OF COASTAL ZONE MANAGEMENT PROBLEMS AND OPPORTUNITIES IN ESCAMBARIA AND SANTA ROSA COUNTIES, FLORIDA.
Florida Coastal Coordinating Council, Tallahassee.
For primary bibliographic entry see Field 02L.
W71-09794

1970 REPORT OF THE INTERSTATE SANITATION COMMISSION.
Interstate Sanitation Commission, New York.
For primary bibliographic entry see Field 05G.
W71-09801

YEAGER V CITY OF PITTSBURGH (NEGLIGENCE IN MAINTAINING OPEN SEWER).

103 Pa Sup Ct 34, 157 A 353-354 (1931).

Descriptors: *Pennsylvania, *Drainage systems, *Storm runoff, *Water injury, Costs, Judicial decisions, Legal aspects, Water law, Structures, Sewers, Open channels, Sewage disposal, Cities, Local governments, Surface runoff, Floods, Rainfall, Water control, Flood control, Overflow, Environmental effects, Storms, Flood damage, Damages.

Plaintiff owned property which was bounded by Beck's Run. Defendant city maintained the run as an open sewer to carry off both storm or surface water and sanitary sewage. The average depth some years before this action had been six feet and had been sufficient to carry off all the water discharged into it. Plaintiff's house, cellar, and garden were flooded after a severe storm. Plaintiff brought suit, alleging that defendant had negligently maintained its sewer, permitting the bed of the run to become filled up with sand and debris so that the normal depth of the run was reduced to two feet or less. The trial resulted in a jury verdict for plaintiff and the Superior Court of Pennsylvania found that there was sufficient evidence to support the verdict. The court stated that when a city uses a stream or water course as an open sewer, it assumes the duty of keeping it clear of obstructions. If, after adequate notice, it permits the channel to become obstructed, with resulting

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Group 6E—Water Law and Institutions

damage to neighboring property, it must respond in damages for the tort. (Johnson-Florida)
W71-09828

GUNDY V VILLAGE OF MERRILL (CITY'S RESPONSIBILITY FOR NUISANCE CREATED BY OPEN DRAINAGE OF SEWAGE).
250 Mich 416, 230 NW 163-164 (1930).

Descriptors: *Michigan, *Sewage disposal, *Drainage systems, *Waste water (Pollution), Judicial decisions, Legal aspects, Municipal wastes, Cities, Waste disposal, Sewage, Wastes, Sewerage, Sewers, Drainage, Drainage practices, Damages, Remedies, Waste water disposal.

Plaintiff landowners sued defendant city and defendant creamery company seeking damages and an injunction. An outlet of the village sewer emptied into an open drain which crossed plaintiff's land. The creamery company also deposited wastes therein. Defendants claimed that the drain was a county drain and that the city had no duty or jurisdiction over it. Defendants further argued that plaintiff had lost his right to complain by prescription, and that plaintiff had contributed to the problem by allowing weeds to grow in the drain. The trial court granted no damages but ordered the nuisance abated within 60 days. The Supreme Court of Michigan modified the judgment by allowing the defendants an extension of time in which to abate the nuisance. A municipality has no right to deposit sewage into an open drain if it will cause a nuisance, nor can prescriptive rights to maintain a public nuisance be acquired. (Robinson-Florida)
W71-09869

SHELBY LOAN AND TRUST CO V WHITE STAR REFINING CO (LIABILITY FOR POLLUTION OF LAKE).
271 Ill App 266-269 (1933).

Descriptors: *Illinois, *Lakes, *Oil industry, *Water pollution, Water pollution sources, Water pollution effects, Water pollution control, Pollutants, Pollution abatement, Oil, Water quality, Water quality control, Legal aspects, Judicial decisions.

Plaintiff riparian landowner sought to enjoin defendant petroleum refining company from polluting a lake on plaintiff's property. Defendant discharged various chemicals and petroleum refuse into surface water which flowed naturally into plaintiff's lake. Defendant contended, however, that it maintained a purifying system, and that therefore the pollution of plaintiff's lake did not result from its discharges. Defendant also asserted that two other companies caused pollution of plaintiff's lake. The Illinois Appellate Court determined that defendant caused at least part of the pollution and stated that defendant would not be relieved of liability because others contributed. A defense of laches was also rejected. Defendant also contended that a permanent injunction would confer no substantial benefit upon plaintiff, while seriously injuring defendant. Nevertheless, the court affirmed the injunction issued by the trial court. (Hart-Florida)
W71-09882

DELAWARE RIVER BASIN COMMISSION RULES OF PRACTICE AND PROCEDURE AND BASIN REGULATIONS—WATER QUALITY.
Code of Federal Regulations, Title 18, Chap III, parts 401 and 410 (1970). 12 p.

Descriptors: *Delaware River Basin Commission, *Regulation, *Delaware River, *Water quality, Administrative agencies, Administrative decisions, Adoption of practices, Water resources, Water resources development, Interstate rivers, River basins, Administration.

The rules of practice and procedure of the Delaware River Basin Commission are in six subparts; subpart A contains rules governing the sub-

mission, consideration, and inclusion of projects in the comprehensive plan for the development of river basin resources. Subpart B describes procedures governing the submission, consideration, and inclusion of projects into the water resources program. Subpart C prescribes rules providing for commission approval before inclusion in the comprehensive plan of any project having a substantial effect on basin water resources. Subpart D provides rules of practice and procedure for review in water quality cases. Provisions for conduct of hearings are delineated in subpart E, including provisions governing staff and expert testimony, record of proceedings, and findings and reports. Subpart F contains general provisions for definitions of words used in the Compact, waiver of rules, and construction of the Compact. The second portion of the regulations, entitled 'Basin Regulations—Water Quality', incorporates by reference provisions previously adopted by the Commission for establishment and enforcement of water quality standards. (Hart-Florida)
W71-09898

6F. Nonstructural Alternatives

FLOOD DAMAGE ABATEMENT STUDY FOR VIRGINIA,
Virginia Polytechnic Inst., Blacksburg. Water Resources Research Center.
William R. Waker.

Available from the National Technical Information Service as PB-200 657, \$3.00 in paper copy, \$0.95 in microfiche. Virginia Water Research Center Bulletin 10, Apr 1971. 293 p, 19 fig, 38 tab, 8 append. OWRP Project A-006-VA (1).

Descriptors: *Floods, *Flood damage, *Virginia, *Flood plain zoning, *Legislation, Non-structural alternatives, Cost-benefit analysis, Water resources development, Urbanization, Flood protection, Channel improvement, River training, Regulation, Flood plain insurance, Flood control, Land use, Zoning.

Identifiers: *Flood damage abatement.

This study gives a quick review of the national flood problem, a comprehensive review of the problem in Virginia, an identification of various programs which have attempted to meliorate flood damages, and two major pieces of legislation recommended to be adopted for further progress in flood damage abatement. Floods are too big a problem to be handled piecemeal. Only when we shift from simply reacting to them to actually planning for them can we expect to make headway in reducing flood damage losses. (Knepp-USGS)
W71-09467

FLOOD PLAIN INFORMATION, LENOIR, NORTH CAROLINA, LOWER CREEK, BLAIR FORK, LONG BRANCH, ZACKS FORK CREEK AND ZACKS FORK BRANCH.

Corps of Engineers, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W71-09600

FLOOD PLAIN INFORMATION, MORGANTON, NORTH CAROLINA - VOLUME 2. CATAWBA RIVER, SILVER CREEK AND BAILEY FORK.

Corps of Engineers, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W71-09845

FLOOD PLAIN INFORMATION, ALBUQUERQUE ARROYOS, PART 1, ALBUQUERQUE, NEW MEXICO.

Corps of Engineers, Albuquerque, N. Mex.
For primary bibliographic entry see Field 04A.
W71-09846

6G. Ecologic Impact of Water Development

THE OAKLEY PROJECT—A CONTROVERSY IN LAND USE,
Illinois State Water Survey, Urbana.

William C. Ackermann.
Environmental Geology Notes, Illinois State Geological Survey, No 46, p 33-39, May 1971.

Descriptors: *Land use, *Conservation, *Social respects, *Flood control, Water resources development, Water supply.

Identifiers: *Metropolitan water problems, *Flood plain management, Environmental quality, Oakley Dam, Allerton Park, Decatur, Illinois Division of Waterways.

Plans are discussed for the proposed Oakley Dam, around which has developed a classic example of controversy in land and widely divergent social values. The Corps of Engineers proposes a dam downstream from Allerton Park (an estate owned by the University of Illinois) for flood control, water supply and recreation for Decatur, and storage for low-flow dilution of treated wastes. The project received great criticism because inundation would ruin parkland, and construction cost estimates rose. A third party to the controversy is the city of Decatur, which has consistently been in strong support of the project because of an urgent water supply problem. The Illinois Division of Waterways has proposed a 'modified project' in order to bring the various parties together. The Committee on Allerton Park, a group of conservationists, has added to the controversy with publicity pointing to the destruction of bottom lands. It is hoped that a system will develop of weighing the environmental impacts as projects are being studied. (Wray-Chicago)
W71-09474

REPORT TO THE CONTRA COSTA COUNTY WATER AGENCY ON A STUDY OF THE EFFECTS OF THE PROPOSED FEDERAL SAN LUIS INTERCEPTOR DRAIN AND THE STATE SAN JOAQUIN VALLEY MASTER DRAIN.
Metcalf and Eddy, Inc., Palo Alto, Calif.

Oct 30, 1964. 93 p, 4 fig, 32 tab, 37 ref.

Descriptors: *Agricultural chemicals, *Deltas, *Drainage effects, *Water quality, *Farm wastes, *Industrial wastes, Municipal wastes, Nutrients, Pesticides, Recreation, Algae, Oxygen demand, Water pollution, Municipal water, Water requirements, Water conveyance, Water costs, Artificial water courses, California.

Identifiers: *Contra Costa County, Water deterioration, Drain, San Joaquin Valley Master Drain, San Francisco Bay-Delta.

The probable effects on the offshore waters of Contra Costa County, California by the proposed drain which will convey agricultural subsurface waste waters from the San Joaquin Valley and wastes from the San Luis Division of the Central Valley Project are discussed. The point of discharge would be the San Joaquin River in the vicinity of the Antioch Bridge. Discharge is expected to begin in 1969 at a rate of 75 cfs and increase to 900 cfs by 1995. Serious deterioration of the quality of offshore waters can be expected by 1975. Aquatic life and recreational use of the offshore waters could be seriously affected by the discharge of nutrients and pesticides from the drain. Nutrients are expected to have a greater effect than pesticides. The nutrients in the drain will produce growths of algae in the drain which by their death and decay will exert an oxygen demand in the river and bay varying from 7500 lbs per day in 1975 to 27,000 lbs per day in 1995. Industry and the City of Antioch will be able to use river water a lesser proportion of the time to satisfy high quality require-

ments. The discharge of the drain will have no significant effect on water for agricultural use. (Poertner)
W71-09577

BAY-DELTA WATER QUALITY SUBCOMMITTEE PRELIMINARY REPORT.

Sierra Club, San Francisco, Calif., San Francisco Bay Chapters.

June 1968. 24 p, 35 ref.

Descriptors: *Estuarine environment, *Bays, *Water quality, *Water pollution control, Water circulation, Water supply, Water demand, Saline water intrusion, Water conservation, Deltas, Thermal pollution, Agricultural chemicals, California. Identifiers: *San Francisco Bay-Delta, *Sacramento-San Joaquin Delta.

The diversion of water is discussed from the San Francisco Bay-Sacramento-San Joaquin Delta estuarine system. Planned reductions in Delta outflow to a 1500 cfs minimum will promote salt water intrusion into Delta waterways. Inflow reductions will also adversely affect water quality within the Bay-Delta system. Upstream storage and diversion projects will probably reduce seasonal 'purging' flows to insignificance. Continued increasing discharge of human and industrial wastes into the system may overload its assimilative capacity, especially with reduced advective flows. The planned introduction of agricultural drainage wastes may have adverse effects on the region's aquatic ecology. Construction of a canal from the pumps to bypass the Delta is probably necessary to mitigate the effects of increased pumping on fishery and water quality. Peripheral Canal intake facilities may prove to be a severe handicap to migrating fish. The proposed widening and deepening of navigational channels may have possible adverse effects on water quality by allowing salt water to intrude below reduced fresh water outflows. Thermal pollution, although not discussed, may reduce oxygen content, alter marine biota, and interfere with migrating fish. Recommendations are presented to avert these problems. (Poertner)
W71-09578

CONTRA COSTA COUNTY AND THE PERIPHERAL CANAL,

Contra Costa County Water Agency, Martinez, Calif.

John A. Nejedly.

Statement before the Superior California Water Association, Red Bluff, Jul 10, 1968. 14 p.

Descriptors: *Deltas, *Water transfer, *Water rights, *Water resources, Costs, fisheries, Legislation, Industries, Agriculture, Municipal wastes, Recreation, Striped bass, California, Estuarine fisheries. Identifiers: *Contra Costa County, *Peripheral Canal, Southern California, San Francisco Bay-Delta.

The statement presented the views of Contra Costa County on the proposed Peripheral Canal. The canal, a 43 mile closed conduit approximately 360 to 530 feet wide, 30 feet deep, with a maximum capacity of 22,000 cfs, will enable Federal and State water agencies to transport water from the Delta to Southern California. Contra Costa County is opposed to the project because complete control over the waters flowing into the Delta would be given to the Bureau of Reclamation and the Department of Water Resources. A study made by the Metcalf and Eddy engineering firm presents costs estimates. It is estimated that, by the year 2000, increased costs in the County resulting from the water export will be \$2.2 million to industrial entities using Delta water, \$1.8 million to the agricultural industry, \$0.9 million for municipal water supplies, and \$2 million in additional waste treatment costs, or a total of 6.9 million additional costs. Because of estimating difficulties, no dollar figures were placed on losses to the recreational and sport

fishing industries. The County requires an agreement, that protects the Delta, which should be incorporated in a judgment by a court of competent jurisdiction and embedded in Congressional and State legislation. (Poertner)
W71-09579

STATEMENT OF THE BOARD OF SUPERVISORS OF CONTRA COSTA COUNTY REGARDING THE REPORT OF THE U.S. BUREAU OF RECLAMATION ON THE FEASIBILITY OF THE 'PERIPHERAL CANAL UNIT CENTRAL VALLEY PROJECT, CALIFORNIA'.

Board of Supervisors of Contra Costa County, Martinez, Calif.

Presented before the Senate Committee on Water Resources and the Assembly Committee on Water, Sacramento, California, September 17-18, 1969. Sep 10, 1969. 6 p.

Descriptors: *Deltas, *Estuarine environment, *Water transfer, *Balance of nature, *Canals, Sedimentation, Eutrophication, Flow characteristics, Water levels, Estuarine fisheries, Bays, California, Water conveyance, Diversion. Identifiers: *San Francisco Bay-Delta, Contra Costa County, Peripheral Canal Unit, San Joaquin Valley.

The statement presented the viewpoint of Contra Costa County, California regarding a report prepared by the U.S. Bureau of Reclamation. That report, entitled 'Peripheral Canal Unit, Central Valley Project, California, A Report on the Feasibility of Water Transfer in the Sacramento-San Joaquin Delta', is concerned with a facility that will transfer water originating in the Sacramento River Basin and Delta to the San Joaquin Valley. Officials of Contra Costa County believe that the facility will alter the hydrology and, consequently, the economy, ecology and environment of the entire San Francisco Bay-Delta system. Contra Costa County has found the Bureau's report to be silent with respect to protection of the San Francisco Bay System. The County claims that this is a shortcoming which must be remedied before the report is approved by the Governor. Some of the areas of concern are: deposition of sediment, algal blooms in slow moving water, areas of poor water quality due to flow patterns, lowering of water levels, and accelerated eutrophication of shallower channels. (Poertner)
W71-09580

EFFECTS OF PLANNED FRESH WATER DIVERSIONS ON THE SAN FRANCISCO BAY AND SACRAMENTO—SAN JOAQUIN ESTUARY,

California Univ., Davis. Dept. of Civil Engineering. Ray B. Krone.

Report to the San Francisco Bay Conservation and Development Commission, May 21, 1970. 7 p, 1 fig.

Descriptors: *Deltas, *Bays, *Water quality, *Water pollution control, *Diversion, Sediments, Water circulation, Absorption, Nutrients, Pesticides, Algae, Dredging, Estuarine environment, California Water conveyance, Canals, Heavy metals. Identifiers: *San Francisco Bay-Delta.

The effects are discussed of the planned diversion of fresh water flows and suspended sediments from the San Francisco Bay and Sacramento-San Joaquin Estuary. Sediment is carried into the Bay System with fresh water inflows. Bay sediments have three outstanding effects: they impair the penetration of light, they absorb tremendous amounts of toxic materials, and clog navigable waterways. The turbidity caused by suspended sediment materials limits the depth to which there is sufficient light for algae to multiply. Since nutrients for algae growth are plentiful in the bay, the limited light penetration due to sediment is the limiting factor to the rapid multiplication of algae in the Bay. The sediments also absorb toxic com-

pounds, such as heavy metals, pesticides, and radioactive fallout. The only foreseeable benefit of the reduced sediments are reduced dredging costs. The report recommends that comprehensive studies be made of the reduced water and sediment inflows; that criteria be established as a basis for regulating fresh water diversion; that an adequate monitoring system be maintained; that the constituent levels and locations of waste discharges to the system be regulated; that new methods of treatment of waste waters for removal of nutrients and toxic materials be developed and supported. (Poertner)
W71-09581

REDUCED FLOWS AND THE FUTURE ECOLOGY OF THE BAY-DELTA SYSTEM,

California Univ., Davis. Dept. of Zoology.

Charles R. Goldman.

Report to the San Francisco Bay Conservation and Development Commission, May 21, 1970. 11 p, 1 fig.

Descriptors: *Deltas, *Bays, *Ocean circulation, *Eutrophication, *Wetlands, *Diversion, *Ecology, Saline water intrusion, Estuarine environment, Watershed management, Nutrients, Algal, Fisheries, Sediment, California, Water circulation. Identifiers: *San Francisco Bay-Delta, Inorganic turbidity.

Ecological implications are summarized of reduced freshwater discharge into the San Francisco Bay-Delta system. A greater intrusion of salt water and a longer retention time for plant nutrients washed in from the Delta, or discharged into the Estuary, is one result. In addition, the quantity of suspended sediments entering the Delta will be reduced. These provide much of the present turbidity in the system. The inorganic sediment particles act to remove phosphorous and heavy metals by collecting on their surfaces and carrying them to the bottom. In all probability, the decrease in inorganic turbidity will be compensated for by a increase in planktonic algae—in response to higher nutrient levels, increased temperature, increase in light transmission, and the longer average retention time of a random unit of water in the system. Unless a very high percentage of the agricultural drainage, as well as domestic pollutants, are by-passed around the Delta to an ocean sewer outfall, we can expect a general eutrophication of the Delta. Synoptic studies of the entire Bay-Delta should be undertaken now to assess the variations in fertility already existing in order to provide a baseline knowledge for any future change that may take place. (Poertner)
W71-09582

COMPREHENSIVE WATERSHED MANAGEMENT—THE ANADROMOUS FISHERY RESOURCE,

Contra Costa Coll., San Pablo, Calif. Dept. of Biology.

Fred H. Tarp.

Report to the San Francisco Bay Conservation and Development Commission, May 21, 1970. 7 p, 1 fig.

Descriptors: *Deltas, *Bays, *Diversion, *Anadromous fish, *Fisheries, Estuarine environment, Eutrophication, Saline water intrusion, California, Striped bass, Salmon, Estuarine fisheries. Identifiers: *San Francisco Bay-Delta, *Peripheral Canal, San Joaquin River, Sacramento River.

The San Francisco Bay-Delta anadromous fish are discussed along with the effects which will result if the proposed Peripheral Canal is built to export water to the San Joaquin Valley and the Los Angeles lowlands. Reduced flows into the Delta will result in salinity intrusion and the provisional rim-flow channels will markedly reduce the dead-end sloughs as a habitat. In addition, increased water transparency and possible temperature effects will affect survival. The anadromous fisheries resource

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of the Bay-Delta estuarine system consists of Striped Bass, King Salmon, Steelhead Trout, Shad, and Sturgeon. At present, the species are endangered by artificial eutrophication, biocides, and toxicants as they pass through the estuarine system in their migrations. The effects of these factors will be aggravated by water export which is the principal operating force responsible for the destruction of environments of anadromous species. There are many gaps in present knowledge of physico-chemical and dynamic parameters of species in the Delta. It will take at least ten years of intensive study to fill in the present gaps. (Poertner)
W71-09583

STATEMENT OF THE BOARD OF SUPERVISORS OF CONTRA COSTA COUNTY, REGARDING EFFECT OF REDUCED OUTFLOW UPON THE SAN FRANCISCO BAY-SACRAMENTO-SAN JOAQUIN DELTA ESTUARINE SYSTEM.
Board of Supervisors of Contra Costa County, Martinez, Calif.

Presented before the Senate Select Committee on Salinity Intrusion in Agricultural Soils; San Francisco Bay-Delta Area Fact Finding Hearing, November 18-19, 1970, Martinez, Nov 17, 1970. 20 p, 2 fig.

Descriptors: *Saline water intrusion, *Tidal effects, *Estuarine environment, *Deltas, *Water pollution control, Discharge (Water), Stratified flow, Sedimentation, Estuarine fisheries, Farm wastes, Industrial wastes, Municipal wastes, Bays, Ocean circulation, Striped bass, California.
Identifiers: *San Francisco Bay-Delta, Contra Costa County, Peripheral Canal.

The proposed export is discussed of San Francisco Bay-Sacramento-San Joaquin Delta water to the southern portion of the state by the Federal Central Valley Project Pumping Plant at Tracy, and the State Water Project Delta Pumping Plant. The reduced Delta outflow could cause serious and drastic effects on the environment by way of salinity intrusion deeper into the Delta and by creating a potential for massive algal blooms. This would have a drastic adverse effect upon the natural and economic resources of the Bay-Delta System. The most important effect on the Delta's migratory fishery resulting from reduced Delta Outflows would be the deterioration of the spawning grounds of the striped bass which can only spawn in fresh water. Any deterioration of the Delta's fishery causes an ancillary adverse effect on the recreational industry. The 'Kaiser Report' emphasized that even with a high degree of treatment provided for all municipal and industrial waste dischargers to the Bay-Delta System, adequate flow of water through the system for flushing purposes is still required. Regarding legislation in this field, the salinity control function of the Central Valley Project and the State Water Project must be fully clarified before other legislation is written. (Poertner)
W71-09584

WATER RESOURCES PROBLEMS AND OPPORTUNITIES ASSOCIATED WITH MULTIPLE-PURPOSE IMPOUNDMENTS,
For primary bibliographic entry see Field 05G.
W71-09633

TOWARD A CONSTITUTIONALLY PROTECTED ENVIRONMENT.
For primary bibliographic entry see Field 06E.
W71-09709

A COMPREHENSIVE STUDY OF SAN FRANCISCO BAY,
California. University of Berkeley. Sanitary Engineering Research Lab.
For primary bibliographic entry see Field 05A.
W71-09790

07. RESOURCES DATA

7A. Network Design

STATISTICAL LIMITS OF ACCURACY AND PRECISION OF GROSS ALPHA AND BETA RADIOACTIVITY MEASUREMENTS IN WATER,
Northeastern Radiological Health Lab., Winchester, Mass.
For primary bibliographic entry see Field 05A.
W71-09626

NATIONAL MONITORING PROGRAM FOR THE ASSESSMENT OF PESTICIDE RESIDUES IN WATER,
Geological Survey, Arlington, Va; and Environmental Protection Agency, Washington, D.C.; and Water Quality Office, Athens, Ga.
For primary bibliographic entry see Field 05A.
W71-09802

7B. Data Acquisition

RADIATION SURVEILLANCE NETWORK.
Division of Operational Safety (AEC), Washington, D.C.
For primary bibliographic entry see Field 05A.
W71-09489

AIRBORNE MEASUREMENTS OF THE TOTAL HEAT FLUX FROM THE SEA DURING BOMEX,
California Univ., San Diego, La Jolla; Scripps Institution of Oceanography, La Jolla, Calif.; and Atlantic Oceanographic and Meteorologic Labs., Miami, Fla.
E. D. McAlister, William McLeish, and Ernst A. Corduan.
Journal of Geophysical Research, Vol 76, No 18, p 4172-4180, June 20, 1971. 9 p, 1 fig, 5 tab, 2 ref.
NSF Grants GA-1491 and 11975.

Descriptors: *Heat balance, *Sea water, *Remote sensing, *Infrared radiation, Solar radiation, Heat budget, Heat flow, Meteorology, Water temperature, Convection, Heat transfer.
Identifiers: *Heat flux (Sea water).

Airborne measurements of the total heat flux from the sea were successfully made during the Barbados oceanographic and meteorological experiment in May 1969. The values found at night ranged from 0.05 to 0.45 cal per sq cm per min and are half-hour averages over contiguous strips of ocean 1.6 km km and 75 meters wide. These are the first airborne measurements of this oceanic factor and the method used is new. (Knapp-USGS)
W71-09602

TWO-STAGE METHOD OF PUMPING BY NEGATIVE PRESSURE,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 08C.
W71-09612

MECHANICAL SAMPLER FOR DETERMINING THE WATER QUALITY OF EPHEMERAL STREAMS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 05A.
W71-09613

A GAMMA ATTENUATION UNIT AND LOGISTIC SYSTEM FOR MONITORING WATER CONTENT OF LARGE SOIL COLUMNS,
North Dakota State Univ., Fargo. Dept. of Soils.
D. K. Cassel, and D. R. Nielsen.

Water Resources Research, Vol 7, No 3, p 731-733, Jun 1971. 3 p, 2 fig, 4 ref.

Descriptors: *Nuclear moisture meters, *Soil moisture meters, *Equipment, *Automation, Monitoring, Cores, Sampling, Soil moisture, Gamma rays, Bulk density.
Identifiers: *Soil cores.

A gamma radiation attenuation unit was designed to monitor water content of large cores of natural soil. A logistic system was developed that allows one person easily to maneuver and monitor soil cores as large as 1 foot in diameter and 3 feet in height. (Knapp-USGS)
W71-09614

THE DIFFERENTIAL THERMAL ANALYSIS OF FLOCCULATED CLAY SAMPLES,
Salford Univ. (England).
For primary bibliographic entry see Field 02J.
W71-09641

PREDICTING EARTHQUAKES BY HYDROGEOLOGICAL METHODS (Russian: K prognozirovaniyu zemletryaseniya gidrogeologicheskimi metodami),
I. G. Kissin.
Sovetskaya Geologiya, No 3, p 118-120, March 1970. 3 p, 7 ref.

Descriptors: *Earthquakes, *Seismic studies, *Groundwater, *Aquifer characteristics, *Seismic properties, Stress analysis, Borehole geophysics, Hydrogeology, Forecasting, Hydrodynamics, Pressure head, Piezometry, Deformation.
Identifiers: *USSR, Tashkent, Tectonics, Tectonic stress, Geostatic pressure, Epicenters, Focus, Hydrochemistry.

Gradual accumulation of stress in the region of earthquake focus affects pressures in the strata and, consequently, groundwater pressure heads. The prediction of earthquakes from hydrogeological data is dependent upon the fixed relationship between changes in stress in the region of focus at various stages of the process preceding an earthquake and the reaction of the 'borehole-aquifer' system. Aquifers are most susceptible to changes in stress in the region of potential focus. The most important factor influencing the groundwater in zones of hydrodynamic anomalies is the effect of geostatic pressure and tectonic stress on fluids. The effectiveness of hydrogeological observations of stress will depend upon the hardness of rocks making up the aquifers and impervious beds, the piezococonductivity of aquifers, the depth of focus, and the intensity of the tectonic processes. Although stress studies are being conducted in regions of potential foci by observations of groundwater pressure heads, the hydrodynamic method requires verification and should be used in combination with other methods dealing with variations in geophysical fields in seismic regions. (Josefson-USGS)
W71-09643

GROUND OBSERVATIONS AND UTILITY EVALUATIONS OF SPACE AND HIGH-ALTITUDE PHOTOGRAPHY, EASTERN ARIZONA,
Raytheon Co., Alexandria, Va. Autometric Operation.
Cecil D. Sapp, Gordon E. Howard, and Burton C. Becker.
For sale by the Superintendent of Documents, US Government Printing Office, Wash, DC 20402—Price 75 cents. Department of the Interior, EROS Program Report, July 1970. 23 p, 35 fig, 3 tab, 15 ref. Dept of Interior, EROS Program Contract 14-08-0001-12064.

Descriptors: *Aerial photography, *Remote sensing, *Infrared radiation, *Water resources, *Arizona, Aircraft, Instrumentation, Methodology, On-site investigations, Photogrammetry, Surface

waters, Topography, Hydrology, Geology, Solids, Vegetation.

Identifiers: *High altitude photography, Imagery simulation.

Ground observations of selected features from Earth Resources Technology Satellite imagery, high-altitude aircraft, and Apollo 9 multispectral photography were made over lands under Department of the Interior administration in eastern Arizona. The field work is supplemental to an earlier effort dated May 1970. The data is compared to that which was found in field investigations. The Safford area is drained primarily by the Gila River, which usually has only a trickle of water in its course during the summer. The black and white infrared photo showed some water present during the overflights. Water contrasts extremely well in the infrared. It is a good absorber and appears very black in relation to the generally light gray background. Numerous detention structures were detected on the photography, even though no water was present behind them. The Goat Well Detention Dam, located west of the Whitlock Mountains, is a curved structure 1 mile long. The June visit to the area found all tanks and detention structures to be devoid of water. Some springs were seen, and one well more than 2,800 feet deep was spurting forth water at about 120 deg F. (Woodard-USGS)

W71-09654

CASING DETECTOR AND SELF-POTENTIAL LOGGER,

Wisconsin State Univ., Superior.

For primary bibliographic entry see Field 08A.

W71-09724

DIRECT CONDUCTANCE METHOD OF MEASURING CASING LENGTHS,

Idaho Bureau of Mines and Geology, Moscow; and Adco Drilling and Research, Inc., Lewiston.

For primary bibliographic entry see Field 08A.

W71-09725

MICROTIME MEASUREMENTS OF GROUNDWATER LEVEL FLUCTUATIONS,

Illinois State Water Survey, Urbana.

For primary bibliographic entry see Field 02F.

W71-09732

PACKER TESTING IN WATER WELLS NEAR

SARASOTA, FLORIDA,

U.S. Geological Survey, Sarasota, Fla. Water Resources Div.

For primary bibliographic entry see Field 08A.

W71-09734

PRACTICAL REMOTE SENSING, THE USE OF A THERMAL MAPPER IN STUDIES OF COOLING WATER DISCHARGES FROM OPERATING THERMAL POWER PLANTS,

Pacific Gas and Electric Co., Emeryville, Calif. M. J. Doyle, Jr., and Vern W. Cartwright.

American Congress on Surveying and Mapping Annual Convention, American Society of Photogrammetry, March 10-14, 1969, Washington, D.C.

Descriptors: *Thermal pollution, *Mapping, Remote sensing, Surveying instruments, Temperature, Infrared radiation, Thermal powerplants, Thermal radiation, Isotherms, Estuaries, Water pollution sources.

The use of a thermal mapper in determining the extent of cooling water discharges from operating thermal power plants is discussed. A basic description of the mapper, its output and ground truth methods are included. Application of computer data reduction techniques to thermal mapper output provides a comprehensive representation of the surface makeup of the discharged cooling waters. A method of subsurface measurement and the development of data analysis techniques designed

to yield a better understanding of the mechanics of thermal discharges is presented. The airborne remote sensing instruments have been used for the study of surface waters adjacent to operating thermal power plants. The thermal mapper used in these studies was a Bendix Model TM/LN-1. (Novotny-Vanderbilt)

W71-09780

EVALUATING OIL SPILL CLEANUP AGENTS. DEVELOPMENT OF TESTING PROCEDURES AND CRITERIA,

California State Water Resources Control Board, Sacramento.

For primary bibliographic entry see Field 05G.

W71-09789

UTILITY OF RADIOISOTOPE METHODOLOGY IN ESTUARY POLLUTION CONTROL STUDIES. PART I. EVALUATION OF THE USE OF RADIOISOTOPES AND FLUORESCENT DYES FOR DETERMINING LONGITUDINAL DISPERSION COEFFICIENT IN ESTUARIES.

Quirk, Lawler and Matusky Engineers, New York.

For primary bibliographic entry see Field 05B.

W71-09791

A CONSTANT GEOMETRY APPROACH TO IN SITU SEABED GAMMA MONITORING,

Ministry of Agriculture, Fisheries and Food,

Lowestoft (England). Fisheries Radiobiological Lab.

For primary bibliographic entry see Field 05A.

W71-09798

FLUORESCENT DYES, THEIR UPTAKE AND TRANSLOCATION IN PLANTS,

Geological Survey, Menlo Park, Calif. Water Resources Div.

For primary bibliographic entry see Field 02I.

W71-09815

7C. Evaluation, Processing and Publication

AN INVESTIGATION OF FLOODS IN HAWAII THROUGH SEPTEMBER 30, 1970,

Geological Survey, Honolulu, Hawaii.

For primary bibliographic entry see Field 02E.

W71-09627

GROUNDWATER DATA AS OF 1967--CENTRAL COASTAL SUBREGION, CALIFORNIA,

Geological Survey, Menlo Park, Calif. Water Resources Div.

J. S. Bader.

Geological Survey Open-file Report, March 5, 1969. 16 p, 1 fig, 30 ref.

Descriptors: *Groundwater, *Water wells, *Hydrologic data, *Aquifer characteristics, *California, Water table, Water level, Water yield, Reviews, Specific capacity, Withdrawal, Pumping, Groundwater recharge, Water temperature, Water quality, Dissolved solids, Chemical analysis, Water resources development.

Identifiers: *Groundwater resources.

Most usable groundwater in the predominantly mountainous Central Coastal Subregion occurs in alluvium-filled valleys and coastal plains and in deeper aquifers of Quaternary and Tertiary age. The intervening mountainous areas are underlain by consolidated sedimentary, igneous, and metamorphic rocks, mainly of Mesozoic age. These older rocks contain only small quantities of recoverable groundwater. Total storage capacity of 16 of the 24 basins is more than 20,000,000 acre-feet. The usable storage capacity of 18 of the basins is more than 7,600,000 acre-feet; the limiting factors are sea-water intrusion and high pumping lift. Groundwater temperature ranges from about 55

deg to about 75 deg F. The dissolved-solids content of the water is generally less than 800 parts per million, but locally is more than 11,000 parts per million. The predominate water type is calcium bicarbonate. Properly constructed wells in some areas can yield as much as 425 gallons per minute. (Woodard-USGS)

W71-09649

GROUNDWATER DATA AS OF 1967 - SOUTH COASTAL SUBREGION, CALIFORNIA,

Geological Survey, Menlo Park, Calif.

J. S. Bader.

Geological Survey Open-file Report, March 5, 1969. 21 p, 1 fig, 97 ref.

Descriptors: *Groundwater, *Water wells, *Hydrologic data, *Aquifer characteristics, *California, Reviews, Water levels, Water table, Water yield, Specific capacity, Withdrawal, Pumping, Water temperature, Groundwater recharge, Water quality, Chemical analysis, Dissolved solids, Aquifers, Hydrogeology, Water resources development.

Identifiers: *Groundwater resources.

Most usable groundwater in the predominantly mountainous South Coastal Subregion occurs in alluvium-filled valleys and coastal plains and in deeper aquifers of Quaternary and Tertiary age. The intervening mountainous areas are underlain by consolidated sedimentary, igneous, and metamorphic rocks, mainly of Mesozoic age. These older rocks contain only small quantities of recoverable groundwater. Total storage capacity of the 44 basins for which determinations have been made is nearly 100,000,000 acre-feet. The usable storage capacity is more than 800,000 acre-feet; the limiting factors are possible sea-water intrusion, thin alluvial material, and, locally, high pumping lift. Groundwater temperature ranges from about 55 deg to about 90 deg F, but locally is as high as 164 deg F. The dissolved-solids content of the water is generally less than 1,000 parts per million, but locally is more than 36,000 ppm. The predominant water type is calcium bicarbonate. Properly constructed wells in some areas can yield as much as 4,850 gallons per minute. (Woodard-USGS)

W71-09650

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR PIN OAK CREEK, TRINITY RIVER BASIN, TEXAS, 1969,

Geological Survey, Austin, Tex.

B. B. Hampton, and D. R. Myers.

Geological Survey Data Report, 1970. 28 p, 2 fig, 4 tab.

Descriptors: *Surface waters, *Hydrologic data, *Data collections, *Texas, *Rainfall-runoff relationships, Floods, Storms, Flood control, Floodwalls, Stream gages, Discharge measurement, Flow rates, Water quality, Chemical analysis, Meteorological data, Hydrographs, Mass curves, Small watersheds.

Identifiers: *Pin Oak Creek (Tex), Trinity River basin (Tex).

This report contains rainfall and runoff data collected during the 1969 water year for the 17.6-square-mile area above the stream-gaging station Pin Oak Creek near Hubbard, Texas. The locations of floodwater-retarding structures and hydrologic instruments in the area are shown. The average rainfall during the 1969 water year was 28.42 inches, or 81 percent of the 12-year (1957-69) average of 35.30 inches. Rainfall was scattered throughout the year with every month receiving some rainfall. The monthly rainfall totals ranged from 0.09 inch in July to 5.46 inches in April. The mean daily discharge at the stream-gaging station Pin Oak Creek near Hubbard was 7.53 cfs, compared with the 13-year (1956-69) average of 11.8 cfs. The annual runoff was 5,450 acre-feet, or 5.81 inches which represents 20 percent of the total rainfall. Computations along with hydrograph and mass curves for storms are shown. Analyses are

Field 07—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

given for two chemical-quality samples from Pin Oak Creek near Hubbard. The water contained calcium and bicarbonate as the predominant ions. (Woodard-USGS)
W71-09653

WATER RESOURCE OBSERVATORY WIND DATA - WATER YEAR 1969 AND PRIOR,
Wyoming Univ., Laramie.
Verne E. Smith.
Wyoming Water Resources Research Institute,
Water Resources Series No 21, Sept 1970, 182 p.
OWRR Project A-001-WYO (36).

Descriptors: Data processing, Computer programs,
*Winds, Anemometers, *Data collections.
Identifiers: *Wind data.

Wind data that have been reduced from recording anemometer charts and from readings of totalizing anemometers are presented in tabular form. The card format and computer program to compute and tabulate the data are also presented.
W71-09745

A FAST FRACTIONAL GAUSSIAN NOISE GENERATOR,
IBM Watson Research Center, Yorktown Heights, N.Y.
Benoit B. Mandelbrot.
Water Resources Research, Vol 7, No 3, p 543-533, June 1971. 11 p, 1 fig, 4 tab, 14 ref.

Descriptors: *Statistical methods, *Markov processes, *Stochastic processes, *Statistical models, *Mathematical models, Synthetic hydrology, Simulation analysis, Probability, Statistics, Systems analysis.
Identifiers: *Gaussian noise.

By design fast fractional Gaussian noises (ffGn) have the following characteristics: The number of operations needed to generate them is relatively small. The long run statistical dependence that they exhibit is strong and has the form required for self similar hydrology. Their short run properties, as expressed by the correlations between successive or nearly successive yearly averages, are adjustable (within bounds) and can be fitted to the corresponding short run properties of records. Extension to the multidimensional (multisite) case should raise no essential difficulty. Finally, their definition, as sums of Markov-Gauss and other simple processes, fits the intuitive ideas that climate can be visualized as either unpredictably inhomogeneous or ruled by a hierarchy of variable regimes. (Knapp-USGS)
W71-09823

USE OF HARMONIC ANALYSIS TO STUDY TIDAL FLUCTUATIONS IN AQUIFERS NEAR THE SEA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 02F.
W71-09824

ANALYSIS OF NONSTEADY FLOW WITH A FREE SURFACE USING THE FINITE ELEMENT METHOD,
Volcani Inst. of Agricultural Research, Bet Dagan (Israel); and California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W71-09826

WELL DATA GLOSSARY,
American Petroleum Inst., Dallas, Texas.
For primary bibliographic entry see Field 04B.
W71-09919

08. ENGINEERING WORKS

8A. Structures

CONTROL OF INFILTRATION AND INFLOW INTO SEWER SYSTEMS.
American Public Works Association, Chicago, Illinois.

Copy available from GPO Sup Doc as , \$1.25; microfiche from NTIS as PB-200 827, \$0.95. Environmental Protection Agency, Water Quality Office, Water Pollution Control Research Series 11022 Eff 12/70, December 1970. 121 p, 12 fig, 43 tab, 135 ref. Contract 14-12-550, Environmental Protection Agency, Water Quality Office.

Descriptors: *Infiltration, *Inflow, *Sewers, *Sanitary engineering, *Leakage, *Inspection, Drainage effects, Design criteria, Design standards, Design flow, Maintenance, Repairing, Joints (Connections), Cracks, Manholes, Surveys, Discharge (Water).
Identifiers: *Illegal connections, *Exfiltration, Roof drains, Foundation drains, Basement drains, Construction allowance.

Problems were studied of infiltration of ground and surface waters into sanitary sewers and inflows from various connections to these sewers. The 'infiltration' water is surface or groundwater that enters sewers through joints, cracks, breaks or indirectly through perforated or loose manhole covers or other faulty sewer structures. 'Inflow' water is piped into the sewer from basement and foundation drains, roof leaders, and other legal or illegal connections of storm sewers and combined sewers. Two hundred and twelve public jurisdictions in the United States and Canada were contacted, and twenty-six communities were visited. Practices of consulting engineers and state and provincial water pollution control agencies were also surveyed. The surveys indicated that infiltration and inflow are widespread problems. Reduction of infiltration should be stressed in both new and old systems. For new sewers a construction allowance of no more than 200 gallons per day per inch of diameter per mile of pipe is recommended. Existing systems must be extensively investigated to determine the extent and location of infiltration. Reduction of inflow waters can be accomplished after sources of such flows have been identified, alternate methods of disposal identified, and the backing of public and governing bodies secured. Twenty recommendations are given indicating the need for extensive investigation of the extent of the infiltration/inflow problem before relief sewers are constructed or waste water treatment plants built or enlarged. (Poertner)
W71-09591

OIL-WELL CEMENTING PRACTICES IN THE UNITED STATES.

Produced by the committees on Drilling and Production Practice, Division of Production, API. New York, American Petroleum Institute, 1959, 297 p 2356 refs.

Descriptors: *Cementing, *Oil industry, *Drilling, Drilling equipment, *Water wells.
Identifiers: History of cementing, API standardization, Physical properties of cement, Surface cementing equipment, Primary cement, Job testings, Squeeze cementing, Deep well cementing, Cementing in lost-return zones, Regulations.

Each year in the United States several thousand wells are drilled and completed - some productive of oil or gas and some dry - and during this drilling and completion most of these wells are cased, with the casing set in the bore hole surrounded by oil-well cement. This book has been written about the process of placing this cement and it covers how

this and related operations are carried out. The compositions used in cementing are basically portland cements or cements prepared by supplementing portland with additives or by variations in grinding or other manufacturing processes. Compositions other than portland cement are sometimes used in wells and often applied using methods closely similar to those used with portland cement. However, this book should in no way be interpreted to mean that portland-cementing methods can invariably be used with other compositions. Some parts of the process of 'cementing a well' are closely similar wherever they might be carried on; while other parts may vary widely, dependent upon geographical location. Nomenclature or terminology particularly vary from one area to the next. This book attempts to fill this gap. It is very well illustrated and referenced. (Campbell-NWWA)
W71-09710

CASING DETECTOR AND SELF-POTENTIAL LOGGER,
Wisconsin State Univ., Superior.
M. H. Frimpter.
Groundwater, Vol 7, No 6, p 24-27, November-December 1969, 5 fig, 5 ref.

Descriptors: *Water wells, *Casing, *Logging (Recording), Water table, Aquifer characteristics, Groundwater.
Identifiers: *Casing length measurements (Wells), Galvanometer, Construction, Operation.

A simple and rapid method of determining casing length and permeable zones in wells tapping bedrock can be useful to sell drillers and hydrologists. A device consisting of a galvanometer, a reel of insulated wire, and a copper electrode locates the casing depth, changes of lithology, and permeable zones. The small-diameter electrode permits measurement through well-seal access ports avoiding the expensive and time-consuming procedure of removing the seal and drop pipes to measure casing depth with a magnet. The measured electromotive force changes rapidly when the electrode passes the end of casing. Thus, the depth of casing is easily determined from the length of wire payed out. Changes in electromotive force measured within the uncased part of a well frequently indicate permeable zones, thereby aiding in choice of the most efficient drop-pipe length, and also yielding useful information for hydrogeologic studies. (Campbell-NWWA)
W71-09724

DIRECT CONDUCTANCE METHOD OF MEASURING CASING LENGTHS,
Idaho Bureau of Mines and Geology, Moscow; and Adco Drilling and Research, Inc., Lewiston.
S. H. Ross, and G. Adcock.
Groundwater, Vol 7, No 4, p 26-27, July-August 1969.

Descriptors: *Water wells, *Casing, Water table, Groundwater.
Identifiers: *Casing length measurements (Wells), Water-level indicator.

The standard water-level indicator can be easily and inexpensively modified so that it also measures casing lengths. The simple modification permits electrical current from one wire of the two-wire probe to be routed through the metal casing. The semiquantitative method works well with most metal casings, including nonmagnetic ones, and can be used to detect most casing reductions. The method is limited in that it works only below the water level in the well, and in that it cannot easily detect casing reductions when the conductance between the upper and lower casings is low. (Campbell-NWWA)
W71-09725

CORROSION OF WELL POINTS AND PIPING IN DOMESTIC WATER NEAR AEC PLANT,
E. I. duPont DeNemours and Co., Aiken, S.C. Savannah River Lab.

E. C. Hoxie.

Groundwater, Vol 2, No 3, p 45-48, July 1964, 1 ref, 6 fig.

Descriptors: *Well points, *Corrosion, *Groundwater, Wells, Screens, Cathodic protection.

Identifiers: *Well point failure, Water analyses, Metallographic examination, AEC plant, Galvanized pipe, Water treatment, Alternative materials of construction.

Describes investigation made to determine cause of excessive corrosion of construction materials of wells supplying domestic water to communities bordering atomic energy plant in South Carolina. Corrosion resulted from natural corrosiveness of soft water with high carbon dioxide and oxygen contents. No effect from atomic energy plant was indicated. This problem was brought to the attention of the AEC by a well driller and local resident who believed that the corrosiveness of the water had increased since the start-up of operations at SRP approximately ten years ago. One of the puzzling features of the problem was that some wells gave good service for seven years or more while others failed in only a year and a half. Corrosion was concentrated below the water level. (Campbell-NWWA)
W71-09726

PREDICTING WELL YIELDS - TWO CASE HISTORIES,

Patchick Consulting Hydrogeologist, White Bear Lake, Minn.
For primary bibliographic entry see Field 03B.
W71-09733

PACKER TESTING IN WATER WELLS NEAR SARASOTA, FLORIDA,

U.S. Geological Survey, Sarasota, Fla. Water Resources Div.
H. Sutcliffe, Jr., and B. F. Joyner.
Groundwater, Vol 4, No 2, p 23-27, March 1966, 1 tab, 5 fig.

Descriptors: *Water wells, *Aquifer characteristics, *Artesian wells, Wells, Subsurface waters, Casing, Florida, Limestone, Water quality.
Identifiers: *Packer testing (Wells), Inflatable packer.

During February and March 1964, the U.S. Geological Survey ran caliper, conductance, and temperature logs on several wells in the Sarasota area. The Florida Geological Survey had previously run gamma ray and electric logs on the same wells. Two flowing wells were selected for packer testing. The two wells are about the same depth, penetrate essentially the same geologic horizons, and are about 16 miles apart. The packers were set in the wells between the producing horizons of the formations penetrated and each of the horizons was tested for head, amount of production, and quality of water. One of the tests produced excellent results, indicating that the various producing zones were effectively isolated by the packers and that different quality of water, quantity of water, and a different head was available from each zone. The other test did not show sharp differences but did indicate the extent of contamination of the producing horizons in a flowing well which had been capped for approximately two years. These tests indicate that packer testing can measurably add to knowledge of the separation of permeable zones. (Campbell-NWWA)
W71-09734

A DOSING SIPHON FOR DISCHARGING CLEANING WATER INTO FLUSHING GUTTERS,

Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05G.
W71-09747

ECONOMIC APPLICATION OF INSERT BITS,

Dresser Industries, Inc. Dallas, Tex.

G. C. Jackson.

30th Annual Meeting American Association of Oilwell Drilling Contractors, September 22-25, 1970, 12 p, 6 fig.

Descriptors: *Drilling, *Rotary drilling, *Drilling equipment, Oil industry, Wells.

Identifiers: Sealed bearing insert bits, Field performance, Limits of performance, Drillability.

Sealed bearing insert bits have proven to be economical in a wide variety of applications previously drilled by sealed and nonsealed milled tooth bits. Economic performance of the relatively new 'medium' and 'soft' types has been obtained mostly on the basis of extrapolation of past experience with 'harder' type bits. The full economic potential of these 'softer' types may have not been achieved. A practical approach to evaluating the possible economy of a sealed bearing insert bit is to examine past performance of milled tooth bits, the logs and the mud programs which produced that performance. A cost analysis of the bit record and a study of the bit record in conjunction with the log and recorded dull condition have proven to be a good approach. Long intervals of similar drillability and cost per foot usually lend themselves to the economical application of a sealed bearing insert bit. Drilling problems, such as deviation, undergauge sections and lost circulation, are added cost incentives. (Campbell-NWWA)
W71-09904

WELL POINTS FOR DEWATERING,

D. G. Noble.
Ground Water, Vol. 1, No. 3, p. 21-26, July 1963, 9 fig.

Descriptors: *Dewatering, *Drainage engineering, *Wells, Ground water, Wellpoints.

Identifiers: *'Running' sand, Australia, Construction excavations, Dewatering method, Well point equipment.

Techniques in use of well-point equipment for dewatering operation in Australia are described. Construction features of equipment used successfully in drying-out trenches for pipelaying, excavation for underground structures, and dewatering base area for low-level pumping stations are discussed. Typical layouts of well-point equipment and typical pumping equipment features are given. Case histories of recent use of well-point equipment are presented. (Campbell-NWWA)
W71-09905

CYCLIC PUMPING FOR DRAINAGE PURPOSES,

California Univ., Davis.
For primary bibliographic entry see Field 04B.
W71-09907

THE GROUND WATER CONSULTANT LOOKS TO THE DRILLER,

Guyton (William F) and Associates, Austin, Tex.
M. L. Klug.
Ground Water, Vol. 4, No. 4, p. 20-22, October 1966.

Descriptors: *Drilling, *Water wells, Logging (Recording), drilling equipment.

Identifiers: *Ground water consultant, *Well contractor, Geologic information, Well construction, Sieve analysis, Well performance, Sand control.

The consultant expects the driller to provide good data and competent performance. Exchange of views associated with drilling and construction can prove to be mutually beneficial. Contacts between the consultants and the drillers have a tendency to upgrade the quality of the basic data collected. These contacts may aid the driller in delivering full performance and thus improve the overall quality of the drilling and construction he performs for the client. As a result, everybody associated with the water well industry - drillers, consultants, and clients - stands to gain by these contacts. It is hoped

that these beneficial contacts within the water well industry will become even more common in years to come so we all can gain from one another's knowledge and experience. (Campbell-NWWA)
W71-09908

SUCCESSFUL ACIDIZING,

Dowell, Inc., St. Louis, Mo.
I. R. Bielek.
Water Well Journal, Vol. 10, No. 8, p. 9, 24-26, 29, 7 tab., 4 ref., August 1956.

Descriptors: *Acidizing, *Water wells, *Stimulation (wells), Aquifer characteristics, Screens, Specific capacity.

Identifiers: Carbonate deposits, Iron deposits, Micro-organisms, Backwashes.

As a result of the survey the effectiveness of the new acidizing techniques, incorporating backwashing and surging, has been established. These techniques have proved effective for use in preventing rapid fall of water levels and steep decline curves resulting from blocking of screens and flow channels by formation particles. For maximum success in an acidizing treatment, all pertinent data should be studied and evaluated. The well history, water analysis, subsurface logs, and past experience are valuable guides in adapting proven techniques to the individual well. Even if the treatment fails to produce the desired production boost sufficient information may be obtained to formulate a successful workover program or prove the well economically dead. (Campbell-NWWA)
W71-09909

ROTARY DRILLING MUDDS,

Nebraska Univ., Lincoln. Conservation and Survey Div.
V. H. Dreeszen.
Water Well Journal, Vol. 13, No. 7, p. 18-20, September 1959, 4 fig., 10 ref.

Descriptors: *Water wells, *Rotary drilling, *Drilling fluids, Wells, Muds.

Identifiers: Cuttings, Mud pit, Well pressure, Filter cake, Caving, Lubrication.

The protection and development of water from permeable formations can be a problem with any type of well drilling method. The methods for protecting water-bearing formations when the rotary method of drilling is used are discussed. The methods are: remove all the cuttings from the hole, do not recirculate cuttings (keep the drilling mud clean), and use a low filter-loss mud to build a thin filter cake opposite permeable formations and to prevent sloughing of silt and clay formations. The drilling mud must be removed from the drilled hole and from the hole walls in order to develop a producing well satisfactorily. The paper is well referenced. (Campbell-NWWA)
W71-09910

APPLICATION AND LIMITATION OF METHODS USED TO ANALYZE PUMPING TEST DATA,

Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W71-09911

SOME PRINCIPLES AND DEVELOPMENTS IN HARD ROCK DRILLING TECHNIQUES,

C. Fairhurst, and W. D. Lacabanne.
6th Annual Drilling and Blasting Symposium, University of Minnesota, October 11-13, 1956. Minneapolis, p. 15-25, 2 tab., 10 fig., 10 ref.

Descriptors: *Drilling, Rotary drilling, *Water wells, Rock mechanics, Drilling equipment.

Identifiers: *Percussive drilling, *Hard rock drilling, Mechanics of rock fragmentation, Wedge angle, Penetration rates, Fracture mechanism, Europe.

Group 8A—Structures

This paper describes the general mechanism of rock breakdown in the two most used drilling methods, namely percussion and drag type rotary. Most other systems can to a large extent be classified within these types. (Table 1) Consideration of the mechanics reveals the reasons why the comparatively recent method of rotary-percussive drilling offers hope for improved drilling performance, especially in the harder rocks. Results obtained in practice in Europe are shown to support this view. Analysis of the basic mechanics of rotary and percussive methods of drilling indicates that each has definite limitations in application, but that it is possible to combine successfully the systems to overcome most of these limitations. Rotary-percussive drilling appears to offer considerable promise for much higher penetration rates in rocks previously too hard to drill by anything other than diamond or straight percussive drilling methods. (Campbell-NWWA)
W71-09912

MODERN DESIGN TECHNIQUES FOR EFFICIENT HIGH CAPACITY IRRIGATION WELLS,

Universal Oil Products, St. Paul, Minn. Johnson Div.
J. W. Reinke, and D. L. Kill.
1970 Winter Meeting, American Society of Agricultural Engineers, Chicago, Illinois, December 8-10, 1970, Paper No. 70-732, 23 p., 2 tabs., 5 fig., 4 ref.

Descriptors: *Irrigation wells, *Ground water, *Water wells, Screens, Casing, Drilling, Drilling equipment.
Identifiers: *Gravel packed well, *Well efficiency, *Well development, Sand pumping, Well life, Design criteria.

Common irrigation well design problem areas are reviewed. Modern design criteria that are presented insure sand-free water, overall high efficiency and long well life. The benefits of suggested procedures are economical, low-cost irrigation wells. The initial cost of the suggested procedures and quality materials is greater than traditional completion methods but is the best investment the irrigation farmer can make. The construction, operation and maintenance costs of an efficient, sand-free irrigation well amortized over a 25-year period will be the cheapest well possible. The long-term economics of modern irrigation well design is in the interest of adding much needed profits to agriculture. (Campbell-NWWA)
W71-09913

DEEP-HOLE DRILLING WITH EXPLOSIVES,

A. P. Ostrovskii.
Russian text was published by Gostoptekhnizdat, State Scientific and Technical Publishing House of the Petroleum and Mineral Fuel Industry, Moscow, 1960. New York, Consultants Bureau, 1962, 133 p., 67 refs., 77 fig., 39 tabs.

Descriptors: *Oil industry, *Drilling, Rock mechanics, Drilling equipment.
Identifiers: *Novel drilling techniques, *Explosive drilling, Penetration rate, Method technology and technique.

The development of an effective method of drilling wells to depths of 3-5 km and more is a complex problem of great practical interest. 'Deep Hole Drilling With Explosives' is a distinctive and very interesting work of the engineer A. P. Ostrovskii, who more than twenty years ago, by his original suggestions, made a start in investigating the field of so-called non-bit processes of shattering rocks when drilling holes, and with his co-workers, developed a fundamentally new explosive method of drilling deep holes. This book discusses the new trend in worldwide application of explosives in technology and the national economy; it presents considerable experimental material on the effect of explosions in solid media, material that is not only interesting to specialists in mining but also to

physicists. Many phenomena discussed by the author and cited in the book still await explanation, but the fact that these phenomena have been already subjected to experimental study undoubtedly adds to our knowledge of one of the most meagerly investigated areas of the science of explosions-concerning the shattering effect of explosions on solid media. (Campbell-NWWA)
W71-09914

WHY STRONG ACID PAYS OFF IN CARBONATE RESERVOIRS,

Dow Chemical Co. Tulsa, Okla. Dornell Div.
O. E. Harris, C. W. Crowe, and R. W. Dennis.
World Oil, Vol. 163, No. 7, p. 76-80, December, 1966, 6 fig., 1 tab., 6 ref.

Descriptors: *Aquifer characteristics, Porosity, Specific yield, *Stimulation, Limestone.
Identifiers: *Fracture acidizing, *Carbonate aquifers, Well completion, Reaction rates, Calcium chloride, Fracture penetration, Inhibition.

Hydrochloric acid in concentrations greater than the 15 percent normally used will significantly improve fracture acidizing results from carbonate reservoirs. Acid properties at concentrations above 15 percent change with increasing concentration. By understanding these changes and how and why they occur, high-strength acid can be advantageously used to provide: (1) Greater formation conductivity resulting in sustained production and injection increases. This is particularly true in reservoirs of high water saturation which make weaker solutions of acid ineffective because of rapid dilution. (2) Greater penetration, because of more rapid initial decrease in area-to-volume ratio. (3) Greater volume of CO₂ gas per barrel of reacted acid. This has proved extremely effective in aiding well clean-up. (4) Greater penetration due to retardation produced by concentration increases of the acid itself and of the reaction products in solution in the partially spent acid. (Campbell-NWWA)
W71-09916

APPLICATIONS OF ACETIC ACID TO WELL COMPLETION, STIMULATION AND RECONDITIONING,

Halliburton Co., Duncan, Okla.
F. N. Harris.
Journal Petroleum Technology, Vol. 13, No. 7, p. 637-639, July 1961, 1 tab., 2 fig.

Descriptors: *Acidizing, *Water wells, Oil industry, Ground water.
Identifiers: *Well completion and stimulation, Acetic acid, Hydrochloric acid, Perforating fluids, Carbonate scale removal, Surfactant carrier, Transitory emulsion.

Acetic acid has been used successfully many times in the past few months, in various treating mixtures and in a number of different applications. It has been used as (1) a perforating fluid, (2) a retarded acid without viscosity, (3) a treatment for removal of carbonate scale in the presence of aluminum metal at elevated temperatures, (5) a 'kill' fluid for wells, (6) a weak aqueous solution for carrying surfactants to remove emulsions and water blocks in the presence of water-sensitive clays, (7) a first-stage treating fluid ahead of hydrochloric acid for a greater drainage pattern and (8) a transitory true gel or emulsion for placement of temporary bridging agents. (Campbell-NWWA)
W71-09917

ROTARY DRILLING HANDBOOK,

J. E. Brantly.
New York, Palmer, 1961, 6th Ed., 825 p.

Descriptors: *Drilling, *Rotary drilling, *Wells, *Oil industry, Pumps, Drilling fluids, Mud, Cements, Casing, Pipe.
Identifiers: Bits, Air and gas drilling, Bit weight, Rotating speed, Straight-hole drilling, Fishing, Formation testing, Safety measures.

This book is one of the few comprehensive classics on rotary drilling produced by the oil industry. This 6th edition has been up-dated to include most of the common techniques in use today. It contains thirty-one chapters and covers the entire spectrum of oil well drilling methods, from the basic principles through pipe and depth measurements, cementing, and safety control. This book can be used as a single source for information on the practical aspects of rotary drilling presently used. Its value to the ground water industry is not found in the many petroleum and natural gas oriented techniques discussed but rather in the philosophy of development over the past years. Some of the techniques are, however, clearly applicable to shallow drilling with only minor modifications or extrapolations, especially the chapters on bits and cementing as well as the glossary, which contains a multitude of semi-pertinent tables, formulas, and graphs. (Campbell-NWWA)
W71-09920

PRINCIPLES OF DRILLING FLUID CONTROL,

American Petroleum Inst., Dallas, Tex.

Edited by Subcommittee of the API Southern District Study Committee on Drilling Fluids. Dallas, American Association of Oilwell Drilling Contractors, 1969, 215 p.

Descriptors: *Drilling fluids, *Drilling, *Rotary drilling, Wells, Drilling equipment, Oil industry.
Identifiers: Drilling fluid composition, Circulating systems, Mud systems, Lost circulation.

The fluid used in rotary drilling, once regarded only as a means of bringing rock cuttings to the surface, is now recognized as one of the major factors involved in the success or failure of the drilling operation. In addition to lifting the cuttings, the drilling fluid must perform other, equally important functions directed toward the efficient, economical, and safe completion of the drilling operation. For this reason, the composition of the drilling fluid and its resulting properties have become the subject of much study and analysis. As attempts are made to drill deeper and consequently more hazardous wells, and to more fully exploit productive formations, the drilling fluid is expected to have physical and chemical properties that enable it to contend functions has required that the composition of the fluid become more varied and its properties more subject to control, with the result that the cost of maintaining an effective drilling fluid has become a major drilling expense in many areas. This manual discusses the well conditions which occasion the need for control of drilling fluid properties, and the most economical means of gaining and maintaining this control. The term 'drilling fluid' includes air, gas, water, and mud. The term 'mud' refers to a suspension of solids in water or oil, or of solids and droplets of one of these liquids dispersed in the other. This training manual discusses each of these drilling fluids, including the modification of muds for use as packer fluids, but deals primarily with those fluids used most often in the field, namely, suspensions of solids in a liquid, 'muds', and suspension of solids and droplets of a liquid in a second liquid, 'emulsion muds.' (Campbell-NWWA)
W71-09921

JET BIT MECHANICS,

Texas Univ., Austin. Petroleum Extension Service.

Petrol 1970, January, 100 p., 19 ref.

Descriptors: *Drilling, *Rotary drilling, *Drilling equipment, Casing, Pipe, Oil industry.
Identifiers: Bits, Horsepower, Rotational energy, Rock fracture, Rock-chip removal, Rock-bit design, Back pressure, Rotary speed.

Probably the most important single realization in rotary drilling is that rock must not only be fractured on bottom, but also must be removed from the rock face instantly and efficiently, to provide for further fracturing and drilling progress. For this

purpose, two types of energy sources are brought from the surface to the rock face and applied as efficiently as possible. These are: (a) Mechanical energy, applied through rotary and drill string, and converted into its most useful form through the mechanism embodied in the bit cones and teeth and (b) hydraulic energy, applied through pump and drill string conduit, and converted into its most useful form through correctly positioned jet nozzles, aimed at the rock face just ahead of the oncoming tooth. Mechanical energy is some times thought of as the medium for rock fracture, and hydraulic energy as the medium for chip removal and bottom scavenging. In fact, however, both types of energy play a part in both rock fracture and rock removal, as we shall see more clearly later in these discussions. Furthermore, although no progress can be achieved without rock fracture, it is undoubtedly the least problematic feature of rotary drilling, and our studies will in consequence be largely concerned with the more complex mechanism of rock cutting removal. Moreover, as the provision of hydraulic energy in its most useful form has already been covered in an earlier manual in this series entitled 'Jet Bit Hydraulics,' our hydraulic analysis here will be concerned principally with the manner in which the hydraulic energy assists and complements mechanical energy at the rock face. (Campbell-NWWA)
W71-09922

JET BIT HYDRAULICS,
Texas Univ., Austin. Petroleum Extension Service.

Austin, University of Texas, Petroleum Extension Service, 1969, 141 p., 65 fig.

Descriptors: *Drilling, *Rotary drilling, *Drilling fluids, *Pumps, Casing, Pipe, Oil industry, Drilling equipment.

Identifiers: Bits, Bit hydraulics, Pressure energy, Energy losses, Static and dynamic pressures, Drill pipe, Pressure drop at bit, Pump pressure.

Drilling nowadays is carried out at high bit loads, often combined with fast rate of rotation to achieve rapid drilling rates especially in softer rock. No such high penetration rates are possible, however, without the aid of a powerful jet stream at the drilling face, assisting the mechanical forces in the process of rock breakage and ensuring that the broken rock particles are swept free of the oncoming rockbit teeth to prevent unnecessary regrinding. The success of our drilling operation demands an adequate supply of hydraulic energy at the bit to perform this function. The cost of supplying such energy will depend, not only on the size of the pump, but on how much of its outgoing energy actually reaches the rock face and performs useful work. It is, then, clearly in the interest of those wishing to reduce footage drilling cost to maintain the hydraulic system on their rigs at a high overall hydraulic efficiency. This manual sets forth in basic terms what must be done to achieve this, and explains why such recommendations are successful. The leading requirement of a hydraulic system for a drilling rig is to provide adequate hydraulic power at the rock face, where the mechanical forces are at work fracturing and removing the rock. The second requirement of a hydraulic system for a drilling rig is to provide fracturing and removing the rock. The second requirement of the system is to provide a means of returning cuttings to the surface, for identification, in such a way as to maintain clean, stable hole condition for drilling and for the passage of bit and drill stem during round-trips. (Campbell-NWWA)
W71-09923

ROTARY DRILLING: THE BIT.

Lesson in Rotary Drilling, Unit I, Lesson 2: The Bit, 1966, 48 p., 46 fig.

Descriptors: *Drilling, *Rotary drilling, Drilling equipment, Oil industry.

Identifiers: *Roller cone bits, *Rock bit selection, Special purpose rock bits, Bit economics, Diamond drilling bits, Drag bits, Specialty bits.

The bit and the way it performs is what drilling is all about. And the bit only performs when it is on bottom. Furthermore, when it is on bottom it makes hole - and money - only when it is effective in that formation. Even then it must be in at least fair condition. There must be weight on it, which is a function of the frill collars. And it must get a hand from the drilling fluid. Finally it must be rotated. Rotation is accomplished by the rotary. Even so, there are tools called turbo-drills where rotation is accomplished by the flow of drilling fluid through a bottom-hole turbine in the drill string. The drill pipe is stationary during the drilling. These are rare exceptions at the time of this writing in 1966. Main consideration in this series will be limited to those bits which are turned by the rotary table. There are many variables in the performance of bits with respect to any given formation. These all resolve into questions of economics, that is, into the selection of the one that seems most likely to make the greatest contribution to the progress of drilling. (Campbell-NWWA)
W71-09924

ROTARY DRILLING: THE DRILL STRING.

Issued by Petroleum Extension Service, University of Texas, Austin. Lessons in Rotary Drilling Unit I, Lesson 3: The Drill String, 1965, 58 p., 15 tab., 61 fig.

Descriptors: *Drilling, *Rotary drilling, Drilling equipment, Oil industry, Pipe.

Identifiers: *Drill string, *Drill pipe, Tool joints, Drill collars, Collar inspection, A.P.I. standards.

The drill string (sometimes called the drilling string) consists of the drill pipe, the tool joints, and the drill collars, together with certain accessories which are commonly used while drilling, although not always required in every situation. These accessories include stabilizers, reamers, and subs (short for 'substitutes'). Although no string of drill pipe is complete without tool joints, the two items are treated separately in order to more clearly describe each and in order to simplify discussion of maintenance of each. In the oil world today an overwhelming majority of all drill pipe is made to standards approved by the American Petroleum Institute. These standards cover the physical properties of the steel from which the pipe is made, the method of manufacture, and the physical dimensions of the pipe. These dimensions cover thread forms, wall thickness, inside and outside diameters, and length of joints of pipe. Also standardized is the weight of the pipe. By agreement between the buyer and the manufacturer, drill pipe can be bought which does not conform to these standards. The important thing is that when the purchase is made on the basis of API standards, the buyer is sure of what he is buying. (Campbell-NWWA)
W71-09925

ROTARY DRILLING: SAFETY ON THE RIG.

Issued by Petroleum Extension Service, University of Texas, Austin. Lesson in Rotary Drilling, Unit I, Lesson 10: Safety on the Rig, 1967, 51 p., 16 fig.

Descriptors: *Drilling, *Rotary drilling, Drilling equipment, Oil industry.

Identifiers: *Drilling safety, First aid, Safety equipment, Safety practices.

Following safety rules and practices is a must in the drilling business. The importance of protective measures on and around drilling rigs cannot be over-emphasized. Safety, of course, is important in everyday living. It is something we are conscious of, no matter what we do, throughout life. It is important in the home, at work or play, on streets and highways, wherever we go. Safety is emphasized much more than usual around a drilling rig because

drilling is a hazardous business. It is a rewarding business for those who like it and grow with it safely, day by day. Drilling personnel must know how to work safely on a rig in order to protect themselves and the expensive equipment they operate. Several hundred thousand dollars are usually invested in a drilling rig which is depended on to 'make hole' efficiently and safely in order to make money. Drilling is a highly competitive business, with constant effort to save valuable time which represents considerable expense to the drilling contractor and to his customer, the operator. Drilling crews must be as fast and efficient as possible but speed and efficiency also require safe operating practices, since accidents and lack of safety precautions can be extremely costly - not only in injuries and damaged or lost equipment but in loss of life. (Campbell-NWWA)
W71-09926

ROTARY DRILLING: MAKING HOLE.

Issued by Petroleum Extension Service, University of Texas, Austin. Lessons in Rotary Drilling, Unit II, Lesson 1: Making Hole, 1968, 55 p., 28 fig.

Descriptors: *Drilling, *Rotary drilling, *Oil industry, Drilling equipment, Drilling fluids.

Identifiers: *Bits, *Drilling time tests, Rotary factor, Hydraulic factor, Differential pressure, Drilling practices, Lost circulation, Tripping.

It is not often that everything can be ideal in drilling. Decisions on the proper course in making hole involve many compromises. A certain section to be drilled is for the most part easy digging - soft shales for example. So a long-tooth bit is run in. In the soft digging there turns up one thin section of hard rock. You dull the bit and pull it before you break out of the hard streak. You decide to run in a hard-formation bit. You drill a few feet and break out into the soft, sticky shale again. Your hard-formation bit just will not cut it. So you pull it. Now, what to do. Could be that you compromise on a bit that will make hole in the soft stuff - though not as fast as you might like. But it will also stay with you longer if you hit another hard stringer. This is a compromise bit that is less than ideal in either the soft digging or the hard. The business of making hole is often a long series of such compromises. To make the right decision the driller and pusher have to be aware of the factors involved in drilling. The most significant of these will be mentioned here and discussed further along. (1) the geological section, (2) the capability of the rig, (3) the drilling fluid program, (4) the bit, (5) three critical factors: weight on the bit, rotary operation, the hydraulic factor. (Campbell-NWWA)
W71-09927

ROTARY DRILLING: DRILLING MUD.

Issued by Petroleum Extension Service, University of Texas, Austin. Lessons in Rotary Drilling, Unit II, Lesson 2: Drilling Mud, 1968, 98 p., 24 tab., 18 fig.

Descriptors: *Drilling, *Rotary drilling, Drilling equipment, Drilling fluids, Wells, Oil industry.

Identifiers: *Drilling mud composition and properties, Conditioning drilling muds, Common drilling problems, Mud treating chemicals and additives.

The drilling fluid, originally regarded only as a vehicle for transporting cuttings to the surface in rotary drilling, is now recognized as one of the major factors involved in the success of the drilling operation. Speed, efficiency, safety, and cost of drilling depend upon the performance of the drilling fluid used. The term 'drilling fluid' properly includes gases, as well as liquids and suspensions of liquids and solids in liquids. This lesson is limited to a discussion of suspensions of solids in a liquid, 'muds', and of solids and a liquid in a second liquid, 'emulsion muds'. As attempts have been made to drill deeper and more hazardous wells and to improve exploitation of productive formations, the

Field 08—ENGINEERING WORKS

Group 8A—Structures

drilling mud has been expected to perform more functions. To perform these functions satisfactorily, the composition of the mud has become more varied and the properties have become more subject to control. The cost of maintaining effective drilling mud is now necessarily a major item of the over-all expense of drilling in many areas. The purpose of this lesson is to discuss the need for, the methods employed in, and the most economical maintenance of effective mud control. (Campbell-NWWA)
W71-09928

ROTARY DRILLING: CASING AND CEMENTING.

For primary bibliographic entry see Field 08F.
W71-09929

ROTARY DRILLING: TESTING AND COMPLETING.

Issued by Petroleum Extension Service, University of Texas, Austin. Lessons in Rotary Drilling, Unit II, Lesson 5: Testing and Completing, 1968, 64 p., 69 fig.

Descriptors: *Drilling, *Rotary drilling, Drilling equipment, Oil industry, Aquifers, Wells, Stimulation.

Identifiers: *Well completion, Formation evaluation methods, Nitro shooting, Acidizing, Hydraulic fracturing.

The economic purpose for drilling oil wells is to produce oil or gas. From the very earliest days it was recognized that testing the porous zones to obtain samples of the fluid contents in a well was an essential part of the drilling job. The cable tool method of drilling in fact made possible a continuous test prior to completing a well. Tests of fluid volume and pressure were accomplished while drilling continued; when the well had tested satisfactorily, or when as much fluid as possible had been obtained drilling was stopped. Sometimes the flow of oil or gas reached such a high rate while 'drillin in' a well that the need arose for a packing gland arrangement around the drilling cable. When the flow of the well began to hold up the tools to such an extent that they would go slack, the tools were pulled and the well was produced until the flow decreased so that deepening could be continued. The inability to sample formation fluids and to test production as drilling proceeded delayed acceptance of the rotary method for a long time. It was recognized that the rotary could make fast hole, but it was also evident that, when using this method, hole might be drilled through productive zones without noticing the evidence of oil or gas. The introduction of coring tools in 1921, drill stem testing (DST) in 1926, and electric logging in 1933, changed the picture completely for rotary drilling. These innovations, and others that followed, made it possible to obtain detailed information of oil and gas shows when they were encountered. Conventional coring was followed by wire line coring; both were almost completely supplanted by electric logging techniques. Drill stem testing and electric log analysis have progressed to the point that formation evaluation can be accomplished without setting casing. (Campbell-NWWA)
W71-09930

ROTARY DRILLING: FISHING.

Issued by Petroleum Extension Service, University of Texas, Austin. Lessons in Rotary Drilling, Unit III, Lesson 2: Fishing 1968, 31 p., 49 fig.

Descriptors: *Drilling, *Rotary drilling, Drilling equipment, Oil industry.

Identifiers: *Fishing (Drilling), Drill pipe recovery, Drill collar recovery, Wire rope and cable recovery.

The term 'fishing' stems from the early cable-tool practice of dangling a homemade hook or spear in

the hole in an attempt to snag a broken drilling line and thereby retrieve the tool attached. On modern drilling rigs, fishing has become the art and science of removing broken or stuck equipment, or small, non-drillable materials from the well bore. The fish may be anything from a part (or all) of the drill string, to smaller pieces of equipment such as bit cones, pieces of tools or any material accidentally dropped into the well bore. Even small pieces of iron pyrite, which occurs naturally in some formations, may work loose and impede drilling to the extent that they must be fished from the hole. There are many types and kinds of fishing tools. Which tools are used depends on the type of fish in the hole, whether the fish is stuck or free, whether it is in a cased or open hole, the condition of the hole at the site of the break, and the condition of the top of the fish. Each fishing job is unique, but there are some basic techniques and tools used in all of them and these will be discussed in this lesson. Furthermore, the lesson will be restricted to fishing in open hole. The term 'open hole' pertains to that part of the hole which does not contain casing. Cased-hole fishing is usually associated with production problems that occur after the drilling rig has moved away; however, some of the techniques used in open-hole fishing are also used in cased-hole fishing. (Campbell-NWWA)
W71-09931

8B. Hydraulics

THE FLOW OF WATER OVER AND WITHIN A PROTECTIVE LAYER OF COARSE, GRANULAR MATERIAL.

Mississippi State Univ., State College. Dept. of Agricultural and Biological Engineering. J. C. McWhorter, and Melville S. Priest. Available from the National Technical Information Service as PB-200 825, \$3.00 in paper copy, \$0.95 in microfiche. Completion Report, Water Resources Research Institute, May, 1971, 19 p, 12 fig. OWRR PROJECT A-046-MISS (1).

Descriptors: Channels, *Oxygen channel flow, *Sedimentation, *Boundries (Surfaces), Hydraulics, *Roughness (Hydraulic), Linings, *Gravels.

The effectiveness of a layer of gravel in shifting the zone of relatively high velocity gradient and correspondingly high shear stress away from a channel bottom is shown by means of graphs. For purposes of generalization, pertinent quantities are arranged in appropriate dimensionless parameters through which the effects of bed slope, relative thickness of gravel layer, and relative size of gravel on a dimensionless velocity profile are presented. It is through comparison of dimensionless velocity profiles that effects and effectiveness become apparent.
W71-09558

COMPARISON TESTS OF PLAIN AND RIFLED DREDGE DISCHARGE PIPE.

Army Engineer Waterways Experiment Station, Vicksburg, Miss. E. B. Pittard, James E. Glover, and Arthur G. Davis.

Available from the National Technical Information Service as AD-722 215, \$3.00 in paper copy, \$0.95 in microfiche. WES Technical report 2-751, Jan 1967. 50 p.

Descriptors: *Inland waterways, *Pipes, *Test procedures, *Dredging maintenance, Sedimentation, Arkansas, Tennessee, Mississippi River. Identifiers: Hydraulic systems, Maintenance equipment, Vacuum pumps, Rifling, Dredges.

Tests were undertaken in the Memphis District to compare rifled dredge pipe with plain dredge pipe. Test results indicate that the output of the rifled pipe did not differ significantly from that of the plain pipe for lengths of 800 ft. Pipeline velocity was found to be closely related to dredge production. The rifled pipeline was equally as productive as the plain pipeline at about 18.5 fps and progres-

sively more productive as the system was loaded to a maximum productivity at about 15 fps. However, the use of rifled pipe with present dredging methods and pipeline lengths is not justified and would be less economical than the use of plain pipe in view of greater cost of rifled pipe and increased fuel consumption. The instrumentation developed for the tests afforded better control of the dredging operation and thereby provided personnel a more positive means of improving production under varying conditions.
W71-09565

WILLOW SPRINGS AND SAG JUNCTION DIVERSIONS, CHICAGO SANITARY AND SHIP CANAL, ILLINOIS, HYDRAULIC MODEL INVESTIGATION.

Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Thomas E. Murphy. Available from the National Technical Information Service as AD-722 230, \$3.00 in paper copy, \$0.95 in microfiche. WES Technical report 2-776, May 1967. 39 p.

Descriptors: *Inland waterways, *Model studies, *Flow, *Channel improvement navigation, Illinois, Flood control.

Identifiers: *Hydraulic models, Hydraulic systems, Chicago Sanitary and Ship Canal, Des Plaines River.

The Turtle Creek channel improvement plan is proposed for the lower end of Turtle Creek near Pittsburgh, Pennsylvania, to provide flood protection for a 20,000-cfs design discharge from the mouth to a point 3.8 miles upstream. The model investigation was concerned with the study of the hydraulic performance of the proposed design in the lower reach, the effect of low level bridges, abutments, and other channel constrictions, and the evaluation of various modifications to the proposed design. An undistorted model, scale 1:50, reproducing the lower 7800 ft of Turtle Creek and a portion of the Monongahela River at the confluence was used for the investigation. Tests indicated that the proposed channel would be generally adequate to carry the design discharge, provided the lower reach is maintained reasonably free of deposition. Additional reduction in stages could be obtained by realignment of the lower 800 ft of channel to eliminate projecting piers and abutments and by removing projections and obstructions remaining in the channel upstream.
W71-09567

TURTLE CREEK, PENNSYLVANIA, CHANNEL IMPROVEMENT. HYDRAULIC MODEL INVESTIGATION.

Army Engineer Waterways Experiment Station, Vicksburg, Miss.

James E. Glover, and John J. Franco. Available from the National Technical Information Service as AD-722 212, \$3.00 in paper copy, \$0.95 in microfiche. WES Technical report 2-765, March 1967. 66 p.

Descriptors: *Inland waterways, *Model studies, *Flow, Sedimentation, Flood control.

Identifiers: *Hydraulic models, Pennsylvania, Turtle Creek.

Proposed diversion channels from the Chicago Sanitary and Ship Canal into the adjacent Des Plaines River at Willow Springs Road and Sag Junction, Illinois, were investigated in 1:60-scale models. Also, a 1:16-scale section model was used to study performance of the gated structures planned for regulation of flow through the diversion channels. Both diversion channels will have their bottoms in rock with concrete retaining walls above ledge rock. A roadway bridge will cross the entrance of each diversion channel, and flow through the channels will be regulated by control structures comprised of 16-ft-wide vertical-life gates—10 gates at Willow Springs and 7 gates at Sag Junction. Impact-type stilling basins will be pro-

vided to dissipate the flow through the gates. The gate structures and stilling basins performed as anticipated. Due to the flat angle at which the Willow Springs Diversion intersected the canal, flow into the diversion was concentrated near the downstream side of the entrance, creating cross-currents in the canal which were considered hazardous to navigation. Equal distribution of flow along the channel entrance and satisfactory navigation conditions in the canal were obtained by installing curtain walls, extending from above the water surface to selected elevations, along the upstream noses of the bridge piers. Navigation conditions at the Sag Junction Diversion were satisfactory. Capacity of each of the diversions was greater than the stated requirement. Calibration data, obtained in the models, should be useful in setting up normal and emergency operating schedules.
W71-09568

ARKANSAS RIVER NAVIGATION ENTRANCE. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.

John J. Franco, Louis J. Shows, and James E. Foster.

Available from the National Technical Information Service as AD-722 213, \$3.00 in paper copy, \$0.95 in microfiche. WES Technical report 2-795, Sep 1967, 50 p.

Descriptors: *Inland waterways, *Model studies, *Flow, *Navigation dams, Arkansas, Mississippi River, Flood control.
Identifiers: *Hydraulic models, River currents, Flow fields, Arkansas River, White River, Flood control.

This study was concerned with the lower portion of the Arkansas River project which enters the Mississippi River through Arkansas Post Canal and White River. Tests were conducted on a fixed-bed model with a horizontal scale of 1:600 and a vertical scale of 1:100 reproducing the Mississippi River from mile 571 AHP to mile 604 AHP, Arkansas River from its mouth to a point about 56.5 miles upstream, White River from its mouth to a point 12 miles upstream, and adjacent overbank and backwater areas. Investigation was conducted to determine effects of various cutoffs on navigation, determine most favorable location for entrance into the navigation canal from Arkansas River, study the flow pattern and velocities in the entrance to the canal, and determine adequacy of proposed flood-control plan. Results of investigation indicated: Arkansas-White Cutoff would continue to develop unless preventive measures were taken. Closing Arkansas-White Cutoff with a fill near White River would essentially eliminate channel flow from the Arkansas to White River which would both improve navigation conditions and reduce the maintenance required in the navigation channel of the lower White River. Closure of cutoff would have little or no effect on stages during major floods. Development of Sawmill Bend Cutoff would increase the tendency for Arkansas-White Cutoff to develop. Development of Avenue Landing Cutoff would tend to reduce stages upstream and flow from Arkansas River toward White River through the Arkansas-White River Cutoff. No serious navigation difficulties were indicated near the mouth of White River under the conditions tested. The Project Plan would provide the best entrance conditions to the navigation canal. The dam should be placed farther downstream than originally planned and training dikes would be required at the head of the bend to improve navigation conditions and reduce the tendency for shoaling.
W71-09569

MODEL STUDY OF HOPPER DREDGE DRAGHEADS. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.

John J. Franco.

Available from the National Technical Information Service as AD-722 214, \$3.00 in paper copy, \$0.95 in microfiche. WES Technical report 2-755, Jan 67, 87 p.

Descriptors: *Inland waterways, Sedimentation, *Dredges, *Model studies, Dredging.
Identifiers: *Maintenance equipment, *Hopper dredges, *Dragheads, Vacuum pumps.

This investigation was conducted to determine the factors affecting the performance of dragheads and to develop parameters for use in the design and operation of dragheads when dredging in sand. The study was conducted in a 60- by 10-ft flume with a 1:6-scale model of the draghead and suction line. The suction line was attached to a centrifugal pump mounted on a carriage which could be made to travel the length of the flume on rails set on top of the flume walls. The scope of the investigation was not sufficiently broad to permit the development of all of the relations affecting the performance of the various types of dragheads but did provide sufficient information to permit the development of indications having practical applications in the design and operation of dragheads for hopper dredges. The results indicated that in general the performance of dragheads is affected by the shape and dimensions of the draghead, position of the draghead with respect to the bed, vacuum, and dredging speed.
W71-09570

SANITARY SEWAGE TRANSPORT VELOCITY,
American Society of Civil Engineers, Cambridge, Mass.

M. B. McPherson, L. S. Tucker, and M. F. Hobbs.
In: *Advances in Solid-Liquid Flow in Pipes and Its Application*; Pergamon Press-Oxford and New York, 1971, p 221-226, 4 fig, 1 tab, 9 ref. Federal Water Pollution Control Administration Demonstration Grant WPD 104-01-66.

Descriptors: *Hydraulics, *Flow rates, *Sewers, *Settling velocity, *Pipe flow, Pipelines, Sewage disposal, Flow separation, Sediment transport, Sanitary engineering, Pressure conduits, Open channel flow, Design flow, Laboratory tests.
Identifiers: *Combined sewers, *Sanitary pressure sewers, Sewer separation.

Tests are summarized of the minimum required flow velocities of sanitary sewage in closed pressure conduits and open channels to preclude deposition of solids. Hydraulic experiments were conducted at the Central Engineering Laboratories of the FMC Corporation in Santa Clara, California using clear plastic pipe of different diameters, from 2 inch through 8 inch. Sewage analyses included determination of pH, COD, grease, total solids, total volatile solids, suspended solids, settleable solids, and specific gravity and amount of settleable solids on each of eleven sieve fractions, the last in terms of both suspended and volatile content. Because no meaningful correlation could be obtained between minimum transport velocities and sewage characteristics analyzed in the initial series of tests, sewage sand content was also determined in the final tests, including specific gravity and amount of each sand sieve fraction. Minimum sand transport velocity findings of Craven for closed conduits, and of Ambrose for closed conduits and open channel flow, are presented as correlated by Laursen. All appropriate full conduit flow data from Ambrose and Craven and the sewage tests are summarized. Velocities causing deposition of suspended solids, and also scouring, were studied. Both comminuted and uncomminuted sewage was employed. This work was conducted in conjunction with the Combined Sewer Separation Project of the American Society of Civil Engineers. It is a study of pressurized sanitary sewerage systems wherein sewage would be pumped from buildings into pressure conduits in existing combined sewers. (Poertner)
W71-09588

INTRODUCTION TO OIL FIELD WATER TECHNOLOGY,

For primary bibliographic entry see Field 05E.
W71-09721

EFFECT OF PHYSICAL PROPERTIES OF POROUS MEDIA ON WATER MOVEMENT,
Idaho Univ., Moscow. Dept. of Agriculture and Bio-Resources Engineering.

For primary bibliographic entry see Field 02F.
W71-09737

TWO LAYER STRATIFIED FLOW IN CONVERGING SECTION,

Water Economics Research Inst., Warsaw (Poland).

For primary bibliographic entry see Field 05B.
W71-09777

MOVEMENT OF SMALL GAS BUBBLES IN SMOOTHLY DECELERATING LIQUID,
Grumman Aerospace Corp., Bethpage, N.Y.

Subba Rao Gutti.

ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY7, Paper 8251, p 1117-1128, July 1971. 12 p, 7 fig, 15 ref, append.

Descriptors: *Flow, *Hydraulics, *Hydrodynamics, *Bubbles, Viscosity, Shear, Channel flow, Non-uniform flow, Unsteady flow, Flow characteristics, Fluid mechanics, Kinetics.
Identifiers: *Accelerating flow, *Multiphase flow.

The time-dependent motion of small gas bubbles in a decelerating liquid was studied. Expressions for the distance traveled by the bubble and for the bubble slip were derived as functions of liquid gas bubble densities, initial velocities, and in terms of a parameter denoting the ratio of the pressure and viscous interaction forces. In cases where the initial velocity of the bubble is lower than the liquid velocity less the limiting slip, the bubble accelerates relative to the liquid. In cases where the bubble initial velocity is equal to or greater than that of the liquid, the bubble decelerates much faster than the liquid until a limiting slip between the gas bubble and liquid is reached. At the equilibrium conditions, in all cases the gas bubble velocity is found to be smaller than that of the corresponding liquid velocity. (Knapp-USGS)
W71-09811

FLOW AROUND INCLINED SHEET PILE,
Indian Inst. of Science, Bangalore. Dept. of Civil and Hydraulic Engineering.

A. Siva Reddy, Govinda C. Mishra, and Kyatsandra Seetharamiah.

ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY7, Paper 8248, p 1101-1115, July 1971. 15 p, 7 fig, 5 ref, append.

Descriptors: *Flow around objects, *Groundwater movement, *Sheet piling, *Seepage, *Steady flow, Numerical analysis, Mathematical models, Flow nets, Permeability, Porous media, Anisotropy.
Identifiers: Inclined sheet piling.

For analysis of flow around a vertical sheet pile in homogeneous anisotropic soil, it is necessary to investigate the flow characteristics associated with an inclined sheet pile embedded in homogeneous isotropic porous media. As such, the quantities of seepage, pressure distribution and exit gradient from an inclined sheet pile embedded in a homogeneous isotropic porous medium of finite depth are determined using the Schwarz-Christoffel transformation. Numerical results are presented for different angles of inclination of sheet piles with and without impervious blankets. (Knapp-USGS)
W71-09812

HYDRAULICS AND HYDRAULIC ENGINEERING (Russian: Gidravlika i Gidrotekhnika).

No 10, Kiev, 1970. 112 p.

Field 08—ENGINEERING WORKS

Group 8B—Hydraulics

Descriptors: *Turbulent flow, *Hydraulic properties, *Hydraulic structures, *Fluid mechanics, Hydraulic gates, Hydraulic conduits, Erosion, Reservoirs, Dams, Cavitation, Open channels, Discharge measurement, Drainage, Design data, Hydraulics, Hydrographs, Unsteady flow.
Identifiers: Quaternary clays, Pressure distribution.

This collection of 18 papers includes articles concerned with study of turbulence, cavitation, unsteady and turbulent flow in open channels, movement of fluid with variable discharge and measurement of discharges in pipe lines. A study is made of the problems of erosion in channels composed of cohesive soils and of the reforming of reservoir banks. Methods for draining Quaternary clays, output of recharge basins, operation of water-purification filters and computations of the stability of faces of earth dams are examined. (Josefson-USGS)
W71-09844

JET BIT HYDRAULICS,
Texas Univ., Austin. Petroleum Extension Service.
For primary bibliographic entry see Field 08A.
W71-09923

8C. Hydraulic Machinery

TWO-STAGE METHOD OF PUMPING BY NEGATIVE PRESSURE,
California Univ., Davis. Dept. of Water Science and Engineering.
Robert J. Miller.
Water Resources Research, Vol 7, No 3, p 726-727, Jun 1971. 2 p, 2 fig.

Descriptors: *Pumping, *Equipment, *Pumps, *Hydrostatic pressure, Hydraulic equipment, Siphons, Air entrainment.
Identifiers: *Vacuum pumps.

A two-stage method of pumping liquids by use of air inclusion was developed to allow liquids to be raised to heights much greater than previously attained with vacuum. The principle of the method is simple and is controlled mainly by careful adjustment of air introduction and vacuum. The apparatus is inexpensive and easy to construct. (Knapp-USGS)
W71-09612

8E. Rock Mechanics and Geology

SOME PRINCIPLES AND DEVELOPMENTS IN HARD ROCK DRILLING TECHNIQUES,
For primary bibliographic entry see Field 08A.
W71-09912

ROCK DRILLABILITY RELATED TO A ROLLER CONE BIT,
Dresser Industries, Inc., Hibbing, Minn.
R. I. Morris.
Society of Petroleum Engineers of A.I.M.E. paper number SPE-2389, 1969. 7 p., 4 ref., 1 tab., 7 fig.

Descriptors: *Drilling, *Drilling equipment, Rock mechanics.
Identifiers: *Rock drillability, Roller cone bit, Mining industry, Bit penetration, Drillability index.

The basic bit penetration mechanism of a roller-cone rotary bit in the development of a drillability index for 'hard' rock mining bits is explored. A 1/8 inch radius, hemispherical drill bit element is pressed into a flat surface of a hand sample with a hydraulic pump and ram until a distinct crater is formed. The crater depth divided by the ram load constitutes a penetration or drillability index, p/E. From this index, bit type, drilling weight, average penetration rate and approximate bit life may be determined. Field results have been well within the degree of accuracy consistent with sampling error. (Campbell-NWWA)

W71-09918

8F. Concrete

OIL-WELL CEMENTING PRACTICES IN THE UNITED STATES.
For primary bibliographic entry see Field 08A.
W71-09710

ROTARY DRILLING: CASING AND CEMENTING.

Issued by Petroleum Extension Service, University of Texas, Austin. Lessons in Rotary Drilling, Unit II, Lesson 4: Casing and Cementing, 1968, 81 p., 58 fig.

Descriptors: Drilling, *Rotary drilling, *Casing, *Cements, Drilling equipment, Oil industry, Drilling fluids.
Identifiers: A.P.I. standards, Running casing, Conductor pipe, Surface casing, Casing minimum performance properties.

Drilling for oil or gas involves two main objectives: (1) to bore a hole to the mineral accumulation, and (2) to install a pipe from the reservoir to the surface. The pipe is called 'casing,' and it is usually cemented to insure a pressure - tight connection to the reservoir. Casing in a well has six important functions: (1) to prevent caving of the hole, (2) to prevent contamination of fresh water in upper sands by fluids from lower zones, (3) to exclude water from the producing formation, (4) to confine production to the well bore, (5) to provide a means of controlling well pressure, (6) to permit installation of artificial lift equipment for producing the well. With the cable-tool method numerous strings of casing were set as a well was drilled. But one principal advantage of the rotary method is the fact that much more open hole can be drilled than was ever possible with cable tools. In rotary drilling today open hole can ordinarily be drilled as far as desired because of the better quality muds available. Casing is generally set to serve a specific purpose and is neither arbitrary nor compulsory on account of any certain hole conditions. The cost of casing is often the greatest single item of expense on a well, and the casing used in a typical well may represent a very large investment. Selection of casing sizes, weights, grades, and types of threaded connections for a given situation constitutes an engineering and economic problem of considerable importance. Assuring good material, running in the well, and cementing in place should be planned procedures. (Campbell-NWWA)
W71-09929

8G. Materials

A.P.I. SPECIFICATION FOR CASING, TUBING, AND DRILL PIPE.
American Petroleum Inst., Dallas, Tex. Div. of Production.

A.P.I. Standard 5A, 31st Ed, April 1971, 70 p.

Descriptors: *Casing, *Well casing, *Drilling, Construction materials, Water conveyance, Wells, Oil industry, Pipe.
Identifiers: Pipe manufacture process, Chemical properties, Physical properties, Hydrostatic tests, Dimensions, Pipe ends, Coupling, Thread protectors, Inspection.

The purpose of this specification is to provide standards for casings, liners, tubing, work tubing and drill pipe suitable for use in drilling and producing operations. This specification covers casing, tubing, work tubing, drill pipe and casing liners in the sizes and wall thicknesses applicable to the various grades of pipe as shown in the standard lists and in the dimensional tables. It also includes casing and tubing couplings and thread protectors. Dimensional requirements on threads and thread gages,

stipulations on gaging practice, gage specifications and certification, as well as instruments and methods for inspection of threads are given in API Std 5B and are applicable to products covered by this specification. (Campbell-NWWA)
W71-09711

A.P.I. SPECIFICATION FOR GRADE C-75 AND C-95 CASING AND TUBING.
American Petroleum Inst., Dallas, Tex. Div. of Production.

API Standard 5 AC, 7th Ed, April 1970, 52 p.

Descriptors: *Casing, *Well casing, *Drilling, Water conveyance, Construction materials, Wells, Oil industry, Pipe.
Identifiers: Pipe manufacture process, Chemical properties, Physical properties, Hydrostatic tests, Dimensions, Pipe ends, Coupling inspection.

The purpose of this specification is to provide standards for casing and tubing with restricted yield strength ranges for use in drilling and producing operations. This specification covers Grade C-75 casing and tubing and C-95 casing in the sizes and wall thicknesses shown in the standard lists (Tables 1.1 and 1.2), and the dimensional tables (Tables 6.1 through 6.6). It also includes requirements for couplings and thread protectors. Dimensional requirements on threads and thread gages, stipulations on gaging practice, gage specifications and certification, as well as instruments and methods for inspection of threads are given in API Std 5B and are applicable to products covered by this specification. (Campbell-NWWA)
W71-09712

A.P.I. SPECIFICATION FOR HIGH - STRENGTH CASING AND TUBING.
American Petroleum Inst., Dallas, Tex. Div. of Production.

API Standard 5AX, 8th Ed, April 1970, 45 p.

Descriptors: *Casing, *Well casing, *Drilling, Water conveyance construction materials, Wells, Oil industry, Pipe.
Identifiers: *Pipe manufacture process, Chemical properties, Physical properties, Hydrostatic tests, Pipe ends, Couplings, Thread protectors.

The purpose of this specification is to provide standards for high-strength casing and tubing suitable for use in drilling and producing operations. This specification covers high-strength seamless steel casing and tubing. It includes casing and non-upset and external-upset tubing, in the sizes and wall thicknesses shown in the standard list, and the dimensional tables. It also includes requirements for couplings and thread protectors. Dimensional requirements on threads and thread gages, stipulations on gaging practice, gage specifications and certification, as well as instruments and methods for inspection of threads are given in API Std 5B and are applicable to products covered by this specification. (Campbell-NWWA)
W71-09713

A.P.I. SPECIFICATION FOR OIL-WELL CEMENTS AND CEMENT ADDITIVES.
American Petroleum Inst., Dallas, Tex. Div. of Production.

API Specification Standard 10A, 16th Edition, April 1971, 19 p.

Descriptors: *Cements, *Cement grouting, Portland cements, Slurries, Oil industry.
Identifiers: *Cement additives, Bentonite, Barite, Fly ash, Chemical requirements, Physical requirements, Well depth and cementing time, Sampling, Tests, Equipment, Classes, Types, Manufacturer's trade names.

This specification covers eight classes of oil-well cement, along with bentonite, barite, and fly ash (tentative) as admixtures in oil-well cement. Two classes of cement are available in the ordinary type (0), seven in the moderate sulfate-resistant type (MSR), and six in the high sulfate-resistant type (HSR), while one has the added property of high early strength. American Petroleum Institute (API) specifications are published as an aid to procurement of standardized equipment and materials. These specifications are not intended to inhibit purchasers and producers from purchasing or producing products made to specifications other than API. (Campbell-NWWA)
W71-09714

A.P.I. SPECIFICATION FOR OIL-WELL DRILLING-FLUID MATERIALS.

American Petroleum Inst., Dallas, Tex. Div. of Production.

API Standard 13A, 5th Ed, February 1969, 12 p.

Descriptors: *Drilling fluids, *Clays, *Drilling, Rotary drilling, Drilling equipment, Emulsions, Mud, Slurries, Foaming, Oil industry.
Identifiers: *Barite, *Bentonite, *Attapulgite clay, Sampling, Inspection, API authorized suppliers.

This specification is under the jurisdiction of the API Committee on Standardization of Drilling Fluid Materials. The purpose of this specification is to provide standards for materials used in oil-well drilling fluids. This specification covers physical properties and test procedures for materials used in oil-well drilling fluids. American Petroleum Institute (API) specifications are published as an aid to procurement of standardized equipment and materials. These specifications are not intended to inhibit purchasers and producers from purchasing or producing products made to specifications other than API. (Campbell-NWWA)
W71-09715

A.P.I. BULLETIN ON PERFORMANCE PROPERTIES OF CASING, TUBING AND DRILL PIPE.

American Petroleum Inst., Dallas, Tex. Div. of Production.

API Bulletin 5C2, 17th Ed, April 1970, 65 p, 4 tab.

Descriptors: *Casing, *Well casing, *Hydraulic structures, Water conveyance, Construction materials, *Drilling, Wells, Oil industry, Pipe.
Identifiers: *Collapsed pressure, *Internal yield pressure, Pipe body yield strength, Joint strength, Compression strength.

This bulletin is not intended as a design manual. Its purpose is to provide minimum performance properties on which the design of casing, tubing, and drill pipe strings may be based. The performance properties as given herein cover the grades, sizes, and weights of casing, tubing and drill pipe as given in API Stds 5A, 5AC, and 5AX. Values for various performance properties of casing, tubing, and drill pipe conforming to API Std 5A, 5AC, and 5AX are given in Tables 1 through 4. The values shown are minimum values and do not include factors of safety. In the design of casing, tubing, or drill pipe strings, factors of safety should be used as are considered necessary for the particular application. (Campbell-NWWA)
W71-09716

A.P.I. BULLETIN ON NONDESTRUCTIVE TESTING TERMINOLOGY.

American Petroleum Inst., Dallas, Tex. Div. of Production.

API Bulletin 5T1, 2nd Ed, April 1971, 14 p.

Descriptors: *Fabrication, *Welding, Welded joints, Construction, Oil industry.

Identifiers: *Testing terminology, Imperfections in steel pipe, Double submerged arc welds, Electric flash-welds, Electric resistance welds.

This bulletin is under the jurisdiction of the API Committee on Standardization of Tubular Goods. The purpose of this bulletin is to provide definitions of imperfections and defects which occur in steel pipe. The word 'imperfection' as used herein refers to metallurgical and other features of steel pipe products which may or may not be injurious to the use of the product. Definition of injuriousness is outside the scope of this document. Injurious defects are defined in the respective pipe standards. It should be noted that the definitions are listed in English, French, German, Italian, Japanese, and Spanish. (Campbell-NWWA)
W71-09717

API SPECIFICATION FOR LINE PIPE.

American Petroleum Inst., Dallas, Tex. Div. of Production.

API Standard 5L, 26th Ed, April 1971, 59 p.

Descriptors: *Pipes, *Well casing, *Construction materials, Hydraulic structures, *Water conveyance, Drilling, Pipelines, Metal pipes, Wells, Oil industry.

Identifiers: *Process of pipe manufacture, Chemical properties and tests, Physical properties and tests, Hydrostatic tests.

The purpose of this specification is to provide standards for pipe suitable for use in conveying gas, water, and oil in both the oil and natural gas industries. This specification covers seamless and welded steel line pipe. It includes standard-weight and extra strong threaded pipe; and standard weight plain-end, regular-weight plain-end, special plain-end, extra-strong plain-end, and double-extra-strong plain end pipe. The sizes and wall thicknesses applicable to the various processes of manufacture under this specification are indicated in the dimensional tables herein. Dimensional requirements on threads and thread gages, stipulations on gaging practice, gage specifications and certification, as well as instruments and methods for inspection of threads are given in API Std 5B and are applicable to products covered by this specification. Grade X60 or higher pipe (API Std 5LX) shall not be substituted for pipe ordered to this specification without purchaser approval. American Petroleum Institute (API) specifications are published as an aid to procurement of standardized equipment and materials. These specifications are not intended to inhibit purchasers and producers from purchasing or producing products made to specifications other than API. (Campbell-NWWA)
W71-09718

A.P.I. SPECIFICATION FOR HIGH-TEST LINE PIPE.

American Petroleum Inst., Dallas, Tex. Div. of Production.

API Standard 5LX, 18 Ed, April 1971, 60 p.

Descriptors: *Pipes, *Well casings, *Construction materials, Hydraulic structures, Pipelines, Water conveyance, Drilling, Well regulations, Metal pipes, Wells, Oil industry.

Identifiers: *Process of pipe manufacture, Chemical properties and tests, Physical properties and tests, Hydrostatic tests, Dimensions, Nondestructive inspection.

The purpose of this specification is to provide standards for more rigorously tested line pipe having greater tensile and bursting strengths than for pipe manufactured under API Std. 5L. Metric conversions of English units are provided throughout the text of this specification in parentheses. This specification covers high-test line pipe in grades X42, X46, X52, X60, X65, and grades intermediate thereto. The chemical composition and certain physical properties of intermediate grades

are subject to agreement between the purchaser and manufacturer. The agreed upon requirements must be consistent with the corresponding requirements for grades X42, X46, X52, X56, X60 and X65. Grade X60 or higher pipe shall not be substituted for pipe ordered for grade X52 and lower without purchaser approval. American Petroleum Institute (API) specifications are published as an aid to procurement of standardized equipment and materials. These specifications are not intended to inhibit purchasers and producers from purchasing or producing products made to specifications other than API. (Campbell-NWWA)
W71-09719

THE EFFECTS OF DRILLING-MUD ADDITIVES ON OIL-WELL CEMENTS.

American Petroleum Institute, Dallas, Tex. Div. of Production.

API Bulletin D-4, March 1963, 39 p, 28 tab, 1 fig, 21 ref. (A report prepared by the API Mid-Continent District Study Committee on Cementing Practices and Testing of Oil-Well Cements.)

Descriptors: *Cements, *Cement grouting, Portland cement, Slurries, Oil industry.

Identifiers: *Cement additives, Cement strength, Thickening time, Retarders, Accelerators, Sodium hydroxide, Sodium carbonate, Sodium silicate, Dosium hexametaphosphate, Sodium acid pyrophosphate, Sodium chloride, Starch, Sodium carboxymethylcellulose, Salts of ligninsulfonic acid-kembreak, Tanninquebracho, Sodium palconate, Tall-oil soap, Carbonox.

The information contained in this report summarizes the data obtained from a series of cooperative tests conducted by the API Mid-Continent District Study Committee on Cementing Practices and Testing of Oil-well Cements to determine the effect of a number of drilling-mud treating chemicals on the thickening time and strength of three types (API Class A, D, and E) of commercial cements commonly used in oil-well cementing operations. This study revealed that many of the additives, notably the organic materials in relatively small quantities, had a marked effect on the properties of the cements tested. The results of this study emphasize the fact that precautionary measures should be taken to prevent contamination of the cement with drilling mud when cementing oil wells. (Campbell-NWWA)
W71-09720

A BASIC STUDY OF FERROUS MATERIALS FOR DESALINATION EQUIPMENT.

Case Western Reserve Univ., Cleveland, Ohio.

A. R. Troiano, and R. F. Heheman.

For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC 20402, Price \$0.65. Office of Saline Water Research and Development Progress Report No 637, December 1970, 59 p, 19 fig, 3 tab, 43 ref, append. OSW Contract 14-01-0001-1443.

Descriptors: *Desalination, *Iron alloys, *Corrosion, *Pitting, Corrosion control.

Identifiers: Instantaneous corrosion rate, Tafel slope, Weight loss tests, *Electrochemical methods, Linear polarization, Surface enrichment.

Of primary interest was an examination and an evaluation, both theoretical and practical, of accelerated corrosion rate measurements by electrochemical methods to provide information much quicker than conventional weight loss tests. These instantaneous corrosion rate determinations also provide a means for continuous monitoring and control of the corrosive environment. There are, essentially two such methods, Tafel, and that of Linear Polarization. Material used throughout most of this work was 'Glidden' iron with impurity contents of C .005, P .003, S .004, Si .005, Cr .001, Co .001, Mn .002, Ni .001 and an alloy of iron - 9% Chromium. Studies were made of the effects of temperature, pH, time, and the influence of

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Chromium alloying and dissolved oxygen. Weight loss studies comprised the second part of this research. Alloys consisted of commercially available ferrous alloys containing major alloying elements of Si, Cr, and Mo and the counterparts of these alloys prepared from high purity elements. Methods and procedures of preparation and testing are presented along with results. A third part of this program explored the concept of surface enrichment of a base metal (iron) with a noble metal. Iron-platinum, iron-iridium, iron-gold alloys were examined. (Filban-Office of Saline Water)
W71-09746

MASTER THE TOOLS THAT COMBAT CORROSION,

Corrosion Mitigation Inc., Marietta, Ga.

H. C. Van Nouhuys.

Pipeline Engineer, Vol. 34, No. 3, p 286, 288, 292 and 294, March 1962.

Descriptors: *Corrosion, *Well casing, *Water well, Groundwater, Water quality.

Identifiers: Galvanic anodes, Rectifiers, Ground bed systems, Pipe coatings.

The corrosion engineer has five basic tools with which to combat corrosion: galvanic anodes, rectifier-ground bed units, coatings, bonds, and insula-

tors. How and where the corrosion engineer uses each method, or combination of methods, can spell the difference between an effective or an ineffective job of corrosion mitigation. Some examples are (1) a bare pipeline in high resistivity soil requires rectifiers instead of galvanic anodes; (2) galvanic anodes, strategically placed in a pump station piping network, give protection that rectifier currents cannot provide; (3) where a coated, protected foreign line crosses under a bare, protected line, a bond is not the answer, but coating the bare line several hundred feet in each direction restores normal potentials to the coated line without bond; (4) a good bond is highly essential, however, at the terminal dock; and (5) the combined use of rectifiers and anodes is not recommended. This papers also has applicability to water well installations. (Campbell-NWWA)
W71-09915

8H. Rapid Excavation

DEEP-HOLE DRILLING WITH EXPLOSIVES,

For primary bibliographic entry see Field 08A.

W71-09914

10. SCIENTIFIC AND

TECHNICAL INFORMATION

A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, SECOND VOLUME.

Cornell Univ., Ithaca, N. Y. Water Resources and Marine Sciences Center.

For primary bibliographic entry see Field 06A.

W71-09465

STUDY OF TRITIUM HAZARDS,

Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre D'Etudes Nucleaires.

For primary bibliographic entry see Field 05C.

W71-09493

A REVIEW OF THE LITERATURE OF 1968 ON WASTEWATER AND WATER POLLUTION CONTROL - INDUSTRIAL WASTE, RADIOACTIVE,

For primary bibliographic entry see Field 05G.

W71-09521

WYOMING WATER AND THE MINERAL INDUSTRY, THE LAW, THE PROBLEMS, AND SOURCES OF INFORMATION,

Wyoming State Engineer's Office, Cheyenne.

For primary bibliographic entry see Field 06E.

W71-09727

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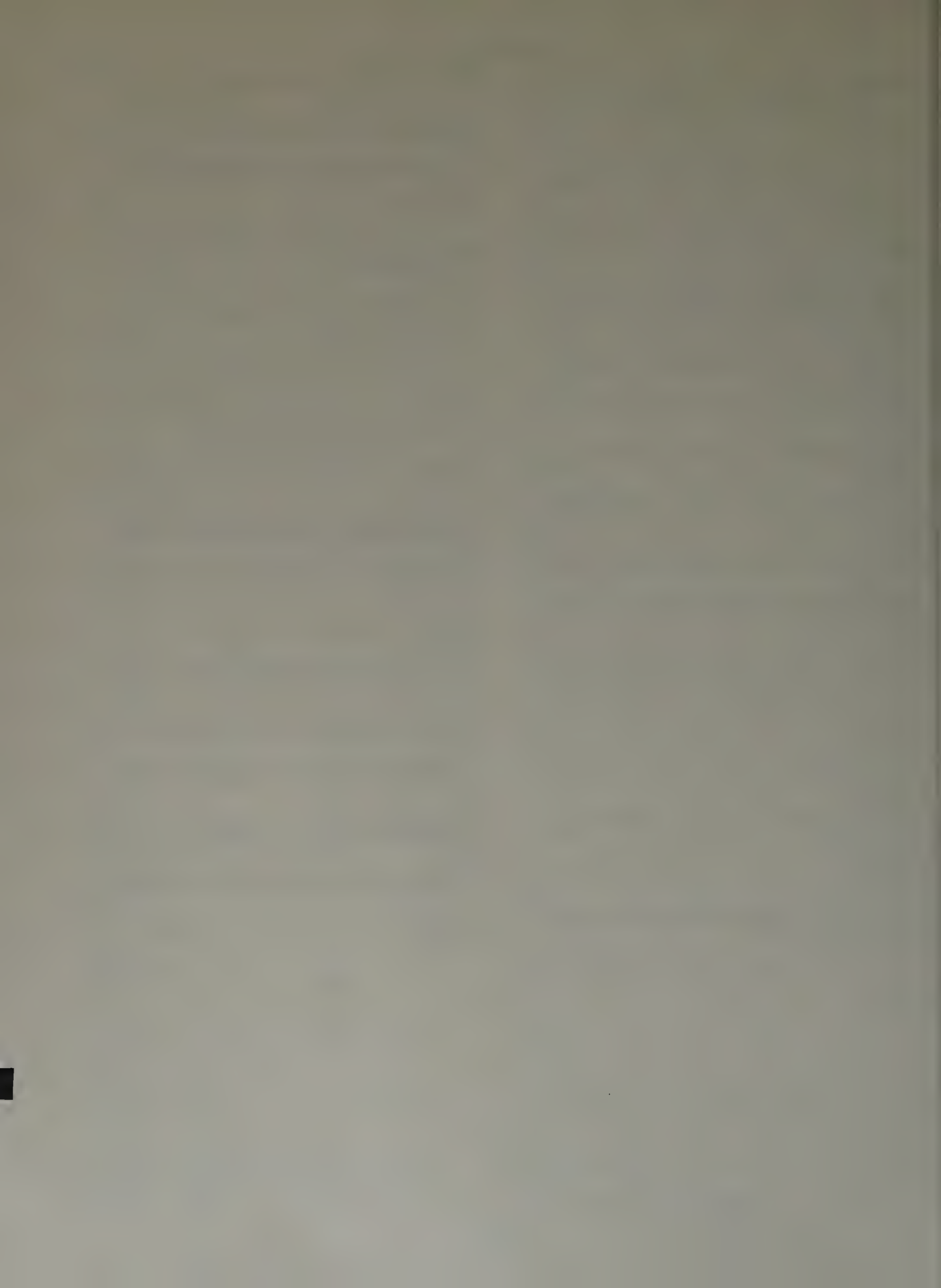
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University of Texas - Wastewater Treatment and Management	W71-09524 -- 09551 09553	29
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Kansas Water Resources Research Institute	W71-09556	1
Minnesota Water Resources Research Center	W71-09557	1
Mississippi Water Resources Research Institute	W71-09558	1
Arkansas Water Resources Research Center	W71-09559	1
Wisconsin Water Resources Center	W71-09560 -- 09562	3
New Hampshire Water Resources Research Center	W71-09563	1
Iowa Water Resources Research Institute	W71-09736	1
Idaho Water Resources Research Institute	W71-09737	1
Texas Center for Research in Water Resources	W71-09742 -- 09743	2
Wyoming Water Resources Research Institute	W71-09745	1
C. Others		
Engineering Aspects of Urban Water Resources (Poertner)	W71-09577 -- 09588 09590 -- 09592	15
Office of Water Resources Research	W71-09468, 09735	2
Office of Saline Water	W71-09746	1

CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Research Institute of Rutgers University.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the EPA-Water Quality Office, Soap and Detergent Association, and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Textile wastes pollution at the School of Textiles of North Carolina State University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Water Quality Office of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association Research Foundation.

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1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION
AND CONSERVATION

4 WATER QUANTITY MANAGEMENT
AND CONTROL

5 WATER QUALITY MANAGEMENT
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